# MASTER PLAN OF DRAINAGE
For
# THE CITY OF ORANGE

Prepared by

PRC Toups

MAY 1981

ORDINANCE NO. 37-81

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF ORANGE AMENDING SECTION 16.16.140 OF THE ORANGE MUNICIPAL CODE CONCERNING THE MASTER PLAN OF DRAINAGE AND FEES RELATED THERETO AND REPEALING ORDINANCE NO. 50-79.

WHEREAS, the City Council, on September 11, 1979, adopted Ordinance No. 50-79 which established a revised fee structure pertaining to storm runoff control facilities pursuant to Resolution No. 5063; and

WHEREAS, Resolution No. 5569 was adopted on November 10, 1981, following a scheduled public hearing pertaining to said matter; said Resolution (1) adopted an amended Master Plan of Drainage dated May 1981 and (2) rescinded Resolution No. 5063; and

WHEREAS, said amended Master Plan designates proposed amended drainage facilities on Plate 4 and drainage assessment fee areas on Plate 5 of said amended Master Plan of Drainage report.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF ORANGE DOES ORDAIN AS FOLLOWS:

SECTION I:

Section 16.16.140 of the Orange Municipal Code is hereby amended to read as follows:

Section 16.16.140 Drainage Fees

The payment of fees shall be required in the following instances, according to applicable provisions of the Subdivision Map Act:

A. As a condition precedent to approval of a tract map, parcel map or other development project within a drainage assessment area shown on the Master Plan of Drainage dated May 1981, owners or developers shall pay a drainage fee to the City of Orange. The purpose of said fee shall be to defray the estimated costs of constructing planned drainage facilities for the removal of surface and storm waters from said drainage assessment area. Fees collected pursuant to this section shall be deposited into a special account established for each assessment area and funds therein shall be expended solely for the construction or reimbursement for construction of local drainage facilities within the drainage assessment area from which the fees comprising the account are collected and to reimburse the City for the cost of engineering and administrative services necessary to design and construct said facilities. Reimbursement to owners or developers who install local master planned drainage facilities which will benefit future development within the drainage assessment area shall be provided pursuant to California Government Code Sections 66485, 66486 and 66487.

B. The fees for each drainage assessment area, as shown on Plate 5 of the Master Plan of Drainage dated May 1981, on file in the office of the City Engineer, shall be as follows:

| AREA | FEE (Dollars/Acre) |
|---|---|
| A | $ 924 |
| B | 835 |
| C | 1,783 |
| D | 2,146 |
| E | 453 |
| F | 1,902 |
| G | 2,218 |
| H | 1,014 |
| I | 398 |
| II | 721 |
| III | 1,042 |
| IV | 1,229 |
| V | 2,539 |
| VI | 2,841 |
| VII | 1,259 |
| VIII | 781 |
| IX | 1,914 |
| X | 1,294 |

C. All fees set forth in this section shall be automatically adjusted on January 1, 1982. The percentage change in the Engineering News-Record, Los Angeles Area Construction Cost Index for the preceding twelve month period shall be the basis for each annual adjustment.

D. Consideration in lieu of fees required pursuant to this section may be accepted by the City Council, provided that:

1. The City Council finds, upon recommendation of the Director of Public Works, that the consideration proposed by the owner or developer as a substitute for the fee has a value equal to or greater than the fee; and

2. The substitute consideration is in a form acceptable to the City Council.

E. The foregoing notwithstanding, the Director of Public Works shall have the authority to determine whether the drainage obligation of the subdivision shall be satisfied by payment of fees or by the construction of master planned drainage facilities. Such a determination shall be based on said Director's evaluation as to the need for protecting the public interest.

STATE OF CALIFORNIA)
COUNTY OF ORANGE ) ss.
CITY OF ORANGE )

I, MARILYN J. JENSEN, City Clerk of the City of Orange, California, DO HEREBY CERTIFY that the foregoing Ordinance No. 37-81 adopted by the City Council of ORANGE, Ca at a regular meeting held November 17, 1981 is a true and correct copy of the original as appears on record in this office.

WITNESS my hand and seal this 18th day of December 19 81.

(SEAL)

marilyn J. Jensen
City Clerk of the City of Orange

SECTION II:

Ordinance No. 50-79 adopted the 11th day of September, 1979, is hereby repealed.

SECTION III:

This ordinance shall be published once within fifteen (15) days after its passage in the Orange City News, a newspaper of general circulation, published and circulated in the City of Orange, and shall take effect thirty (30) days from and after the date of its final passage.

ADOPTED this 17th day of November, 1981.

"ORIGINAL SIGNED BY
JAMES BEAM"

Mayor of the City of Orange

Attest:

"ORIGINAL SIGNED BY
MARILYN J. JENSEN"

City Clerk of the City of Orange

STATE OF CALIFORNIA )
COUNTY OF ORANGE ) ss
CITY OF ORANGE )

I, MARILYN J. JENSEN, City Clerk of the City of Orange, California, do hereby certify that the foregoing ordinance was introduced at the regular meeting of the City Council held on the 10th day of November, 1981, and thereafter at a regular meeting of said City Council duly held on the 17th day of November, 1981, was duly passed and adopted by the following vote, to wit:

AYES: COUNCILMEN: Barrera, Smith, Mayor Beam, Beyer

NOES: COUNCILMEN: None

ABSENT: COUNCILMEN: Perez

WITNESS my hand and seal this 18th day of November, 1981.

"ORIGINAL SIGNED BY
MARILYN J. JENSEN"

Marilyn J. Jensen
City Clerk of the City of Orange

RESOLUTION NO. 5569

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF ORANGE ADOPTING AN AMENDED CITY-WIDE MASTER PLAN OF DRAINAGE AND RESCINDING RESOLUTION NO. 5063.

WHEREAS, the City Council, on August 28, 1979, adopted Resolution No. 5063 which established the June 1979 Master Plan of Drainage prepared by P.R.C. Toups Corporation as the City's official plan for local storm runoff control facilities; and

WHEREAS, certain revisions to said Master Plan of Drainage were required by the County of Orange prior to the Board of Supervisors concurring with said plan as being in conformance with the County's General Plan; and

WHEREAS, said revisions to City's June 1979 Master Plan of Drainage have been prepared and incorporated in an amended report dated May 1981; and

WHEREAS, a public hearing was held on November 10, 1981, for the City Council to consider adoption of said amended Master Plan of Drainage as the official plan for local storm runoff control facilities; and

WHEREAS, the City Council found that subdivision and development of property within the area included in said amended Master Plan of Drainage will require construction of facilities described in said amended Master Plan; and

WHEREAS, the City Council found that the estimated costs of constructing said master planned facilities will be those costs itemized in said Master Plan of Drainage report; and

WHEREAS, the City Council found that the proposed fees are fairly apportioned within the drainage areas, either on the basis of benefits conferred on property proposed for subdivision or on the need for such facilities created by the proposed subdivision and development of other property within such areas; and

WHEREAS, the drainage facilites planned are in addition to existing facilities serving the area included in said amended Master Plan of Drainage.

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Orange that the Master Plan of Drainage dated May 1981, prepared by P.R.C. Toups Corporation, is hereby adopted as the official plan to guide the construction of all local storm runoff control facilities in the City of Orange; however, the exact sizes and locations of storm drain facilities shall be determined by independent hydrological and hydraulic analyses and land use considerations at the time of actual design of said facilities.

BE IT FURTHER RESOLVED that the Orange County Board of Supervisors shall be requested by the Director of Public Works to adopt a resolution finding that City's Master Plan

of Drainage dated May 1981 is in conformity with the County's General Plan pursuant to Section 66483(c) of the California Government Code.

BE IT FURTHER RESOLVED that, pursuant to the adoption of this resolution, the City Council shall adopt an amended ordinance establishing fees for the construction of planned local drainage facilities.

BE IT FURTHER RESOLVED that Resolution No. 5063 adopting the Master Plan of Drainage dated June 1979 is hereby rescinded.

ADOPTED this 10th day of November, 1981.

"ORIGINAL SIGNED BY JAMES BEAM"

Mayor of the City of Orange

Attest: "ORIGINAL SIGNED BY MARILYN J. JENSEN"

City Clerk of the City of Orange

I hereby certify that the foregoing Resolution was duly and regularly adopted by the City Council of the City of Orange at a regular meeting thereof held on the 10th day of November, 1981, by the following vote:

AYES: COUNCILMEN: Barrera, Smith, Mayor Beam, Perez, Beyer

NOES: COUNCILMEN: None

ABSENT: COUNCILMEN: None

"ORIGINAL SIGNED BY MARILYN J. JENSEN"

City Clerk of the City of Orange

STATE OF CALIFORNIA)
COUNTY OF ORANGE ) ss.
CITY OF ORANGE )

I, MARILYN J. JENSEN, City Clerk of the City of Orange, California, DO HEREBY CERTIFY that the foregoing Resolution No. 5569 adopted by the City Council of Orange, Ca at a regular meeting held November 10, 1981 is a true and correct copy of the original as appears on record in this office.

WITNESS my hand and seal this 18th day of December 1981.

(SEAL)

Marilyn J Jensen

City Clerk of the City of Orange

# FINAL
# MASTER PLAN OF DRAINAGE
# FOR
# THE CITY OF ORANGE, CALIFORNIA

Prepared by

PRC TOUPS
972 Town & Country Road
Orange, California 92667



MAY 1981

CONTENTS

CONTENTS (Continued)

## SUMMARY

This report is the result of a comprehensive study of the storm drainage needs of the City of Orange. Hydrologic studies of the City and its surrounding planning area were performed. Hydraulic analysis of existing drainage systems was undertaken and a deficiency report prepared. That report was submitted to the City in November 1978.

Based on the hydrologic studies, hydraulic analysis, and the results of the deficiency study, proposed remedial and future drainage systems were derived based on criteria described in this report. Cost estimates and priority rankings were also developed.

The following conclusions and recommendations were reached as a result of the study:

### CONCLUSIONS

1. Most storm drain systems constructed 35 years ago or more are inadequate to contain runoff from present day developments. This condition occurs primarily in the central portion of the City.

2. Full implementation of the recommended system will cost $29.3 million based on January 1981 estimated costs. Of this amount, facilities costing $15.1 million occur in presently developed areas.

3. Present laws relating to limitation on property tax assessments reduce the likelihood of county participation in certain drainage projects.

4. Imposition of drainage area assessment fees on presently undeveloped portions of the study area will assure adequate funding as those areas develop. These fees vary from $398 to $2,841 per acre. Annual adjustments of these fees will allow continued correlation with construction cost increases.

5. Some of the potential flooding problems within the study area are due to undersized regional facilities.

### RECOMMENDATIONS

1. That the City Council adopt this report as the Master Plan of Drainage for the City of Orange, superseding all previous plans within the study area.

2. That drainage area assessment fees per the schedule included in this report be imposed on those areas shown on Plate 5.

3. That the drainage area assessment fees be reviewed annually and updated as necessary.

4. That construction of recommended facilities be scheduled in accordance with the priorities established by this report and keyed to the availability of funds.

5. That the funding methods presented be thoroughly investigated with special effort directed to promoting participation in current and future federal and county financial assistance programs, thereby lessening the tax burden at the local level.

6. That costs, priorities, and facilities and funding recommendations be periodically reviewed and updated to reflect continuing economic, legislative, and social changes.

# CHAPTER 1

# INTRODUCTION

## SCOPE OF STUDY

In November 1977, the City Council authorized the Director of Public Works to undertake a comprehensive drainage deficiency study and preparation of a Master Plan of Drainage, which would serve as the basis for future stormwater management in the City of Orange and its Planning Area. The project would serve five purposes: 1) Provide a comprehensive tabulation of projected storm runoff throughout the City; 2) identify those areas of the City where the lack of properly-sized drainage facilities would cause property inundation during periods of excessive runoff; 3) determine added drainage facilities necessary to alleviate such flooding, including estimated costs; 4) determine needed drainage systems for currently undeveloped areas, which will establish guidelines for the orderly construction of facilities as land development progresses in the future; and 5) discuss methods of possible financing.

The study was divided into three Phases, the elements of which are discussed later in this report:

Phase I

- Drainage areas were delineated.
- All existing drainage facilities were identified.
- Hydrologic analyses were performed for 10-year and 100-year frequency storms.
- Deficient systems were identified.
- A written report was prepared outlining all existing drainage systems and their level of deficiency, when pertinent.
- A set of inundation maps was prepared depicting deficiencies.

Phase II

- Drainage systems were determined in areas of existing development.
- Stormwater systems were sized for undeveloped portions of the study area.
- Cost estimates were prepared, and a set of priorities for construction were determined.

- o Drainage assessment areas and fees were calculated.

Numerous conferences with City personnel during Phase II of the study led to concurrence on recommended drainage systems.

Phase III

- o The Master Plan report was prepared.
- o The Master Plan Report was presented to the Planning Commission and the City Council for adoption.

## HISTORY OF DRAINAGE WORKS

The City of Orange, one of the oldest cities in Orange County, began the development of its water, sewer, and storm drainage systems in the early part of this century. The major industries in the City and surrounding areas prior to 1940 consisted of row crops and orchards requiring drainage systems sized predominantly for runoff from agricultural areas. The subsequent ten-fold increase in population from 1930 to 1978, in conjunction with the urban development of orchards and fields, greatly increased the storm runoff and rendered a major portion of the drainage system inadequate. Plate 1 shows areas of concentrated runoff within the City.

The City grew rapidly after World War II, with population increasing 164 percent during the 1950's and 193 percent during the 1960's. The City subsequently has recognized the need for drainage master planning which would assure integrated and balanced systems. Along with many other communities, Orange has realized the cost-effectiveness of accounting for future growth patterns and increased urbanization by estimating runoff during drainage system design stages.

In recognition of these needs, drainage studies and master plan projects were undertaken for different areas of the City. The first such study, in the early 1960's, focused on the northwest portion of the City, i.e., roughly that area north of Katella Avenue and west of Center Drive in the City of Villa Park. At the time, this was the fastest growing area of Orange. The study established the sizing and location of proposed facilities and served as a basis for drainage assessment fees. This study was subsequently amended, and its conclusions and recommendations were considered in the preparation of this report.

In 1969, a combined City-County effort produced the El Modena-Irvine Master Plan. The Plan adopted by the City in 1970, similar to the North Orange Study, also served as the basis for establishment of drainage fees.

A study of the Orange Park Acres was started in the early 1970's but was never completed. However, its findings have provided guidelines for needed facilities. Similarly, studies providing a guide for updating

MAIN ST. NEAR CULVER AVE., FEB. 1979

SANTIAGO CREEK AT HART PARK, FEB. 1978

**PLATE 1**

deficient systems were conducted internally by the City for the central area south of Katella Avenue and west of Villa Park. A formal master plan for that area has never been completed.

Today, the path of the City's expansion is toward the east and northeast, an area largely undeveloped at present. Accordingly, a Master Plan of Drainage for that area, the planning area, and other areas within the City is needed if systematic development of drainage facilities is to be accomplished.

This report is an effort to update existing studies and to conduct new investigations in order to provide a comprehensive and complete determination of the City's present and future drainage needs.

# CHAPTER 2

# STUDY AREA

A large portion of the City of Orange is located on the alluvial plain formed by the Santa Ana River and Santiago Creek. This area is relatively flat with an overall ground slope of 0.7 percent in a westerly direction toward the river. This is the principal urbanized area within the study perimeter; most of the City's commercial and industrial centers are located here.

This alluvial plain is roughly bounded on the east by Santiago Boulevard and Hewes Avenue. Those areas outside the plain are almost exclusively gently rolling hills, characterized by low-to-medium density residential uses.

Orange Park Acres, bounded on the north and east by Santiago Creek and on the west by Rancho Santiago Road, represents the eastern limit of existing development within the study area. Much of this area is presently unincorporated, consisting of low-density improvements. A significant portion of the area is zoned either for 40,000 square foot minimum lot size or for agriculture.

The area north and east of Orange Park Acres is largely undeveloped with some of the eastern portion owned by the Irvine Company.

The majority of local flooding, due to runoff from the foothills, flows westerly into the central area. The County mitigates this flooding problem through regional facilities which intercept the runoff and carry it, via open channels and underground conduits, to the Santa Ana River and Santiago Creek. The City has provided a network of facilities to absorb the runoff and carry it underground to the regional channels or, in some cases, directly to the natural streams.

## LAND USE

Land use is one of the primary factors in determining how much rainfall on a given area is converted into surface runoff. For example, if, over an equivalent period of time, the same amount of rainfall were to fall on two equal land areas, one a commerical shopping locality, the other an agricultural plot, more runoff would be generated from the former which has large paved parking lots than from the latter which is used for agricultural purposes.

The Land Use Element of the City's General Plan was used to account for ultimate land use. These uses have been converted into categories for hydrologic calculations according to the relationships shown in Table 2-1.

TABLE 2-1. TABLE OF LAND USE DEVELOPMENT

| General Plan Land Use Element | Hydrologic Categories |
|---|---|
| Park, agriculture, open space, and estates 0-1 units/AC | Park-1 U/AC |
| Estate low density 2 units/AC | School-2 U/AC |
| Low density 2-6 Units/AC | Single Family-3 to 8 U/AC |
| Medium and high density 6-24 units/AC | Multiple Family |
| Commercial and Industrial | Commercial |

## SOIL CLASSIFICATION

Another primary factor in determining runoff is soil type. Orange County uses the Soil Conservation Service (SCS) classification of soils to calculate infiltration and runoff rates.

The SCS hydrologic soil groups are as follows:

Group A. Soils having high infiltration capacities even when thoroughly wetted and chiefly consisting of deep, well to excessively well drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having moderate infiltration capacities when thoroughly wetted and chiefly consisting of moderately deep to deep, and moderately well to well-drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

Group C. Soils having low infiltration capacities when thoroughly wetted and chiefly consisting of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. These soils have a low rate of water transmission.

Group D. Soils having very low infiltration capacities when thoroughly wetted and chiefly consisting of clay soils with a high swelling potential, soils with a permanent high water table, soils with a clay pan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission.

The soils in the study area are approximately evenly divided between Groups B and D. Group A occurs only in the bottom of natural streams. There are no Group C soils within the study area.

# CHAPTER 3

# ENGINEERING ANALYSIS

The development of this comprehensive master drainage plan includes the examination of protection criteria and reflects the current state of knowledge in hydrologic concepts. Because of the passage of the National Flood Insurance Act of 1968, it is no longer practical to limit the analysis of drainage problems to those caused by floods of 10-year or 25-year return periods. The Flood Insurance Act uses the 100-year flood as the basic criteria. Accordingly, the study area was analyzed using 100-year as well as 10-year frequency floods.

A 10-year flood is defined as that magnitude of flooding which has a 10 percent probability of occurring in any given year. Similarly, a 100-year flood has a one percent probability of occurrence in a given year.

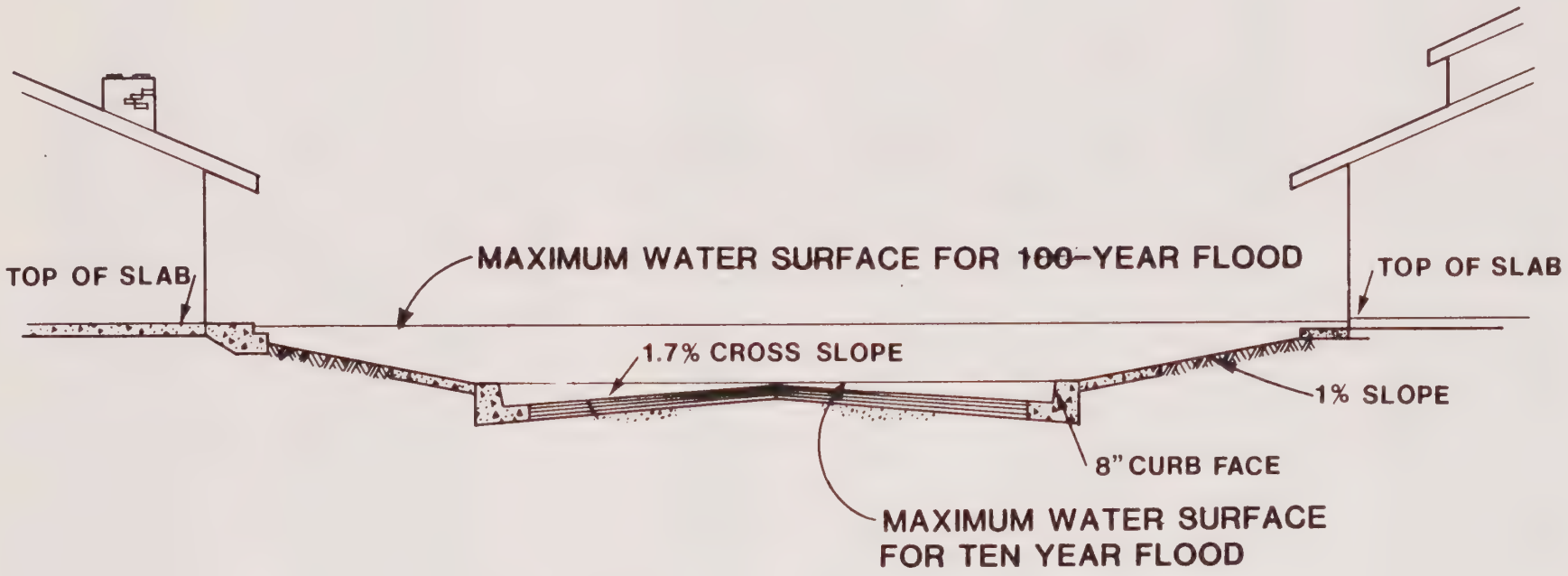
## CRITERIA

Sizing of proposed facilities was based on providing sufficient pipeline conveyance such that the water surface for the 100-year flood will be no higher than the top of slab of adjacent structures, and that the water surface of the 10-year flood will be no higher than the top of curb, as shown on Plate 2. In addition, proposed facilities were sized to provide one flood-free driving lane in each direction for arterial streets. Hydraulic computations were carried out for each of the indicated conditions, and the largest pipe size determined was selected.

The Orange County Environmental Management Agency's design criteria indicates that the hydrograph method is to be used for the 100-year recurrence interval while their Rational Method is to be used for the 10-year recurrence interval. Because different criteria were used in developing the two methods, the results are not analogous. Therefore, rational methods presented here were used to determine runoff for both the 10-year and 100-year conditions in order to provide results that are directly comparable.

Once the peak runoff was determined for a particular system, that system was checked to ascertain whether or not it could contain the calculated flow. For existing conduits, a computer program designated STORM was used to calculate the hydraulic grade line. If the hydraulic grade line remained at least one foot below the ground surface at all points, the system was deemed to be adequate.

If the system were undersized, as evidenced by the hydraulic grade line rising above the ground surface, the actual capacity was estimated considering the conduit slope and depth below grade. Any runoff in excess




# FLOOD PROTECTION CRITERIA

PLATE 2

of the estimated capacity was assumed to be carried in the street (if any) above the conduit. If this excess flow could not be contained between the curb faces, the system was regarded as inadequate.

If there were no storm drainage facilities within the street right-of-way, the street itself was considered a drainage system. If the depth of runoff was higher than the curb face, the street section was considered inadequate to convey the flow.

The scope of work did not allow for the actual section and curb height to be used. Typical sections as shown in the City's Standard Plans were used instead. Similarly, in determining depth of flow above top of curb, a standard section, as shown on Plate 2, was assumed in all cases.

In order to provide meaningful results, the actual elevations of finished floors above the tops of curbs had to be determined. This could not be directly ascertained from the City's drainage maps in all cases; however, the elevation adjacent to the structure could always be found. If this elevation was below the anticipated flooding, those areas were field checked by City personnel in order to determine finished floor locations.

In undeveloped areas, storm drain systems were designed to carry the 100-year flow once the estimated street capacity had been exceeded. In no case was it assumed that more than 70 cubic feet per second (cfs) would be carried in the street. This is the capacity to top of curb for a 36-foot street at a one percent slope.

From these comparisons, the most practical system was pinpointed, and cost estimates calculated. Based on the deficiencies identified, a priority system was set up for construction in the developed portion of the City. This provides a logical and systematic method for allocation of available funds.

## HYDROLOGY

The basic assumptions of the Orange County Rational Method of Hydrology are: 1) rainfall intensity varies inversely with duration of rainfall; 2) rainfall and runoff are constant over a given area during a given time of duration. This results in a simple relationship whereby the peak discharge in cubic feet per second is equal to the product of the runoff in inches and the area in acres. This is expressed by the equation:

$$Q=CIA$$

CI represents the runoff and is the rainfall intensity (I) for a particular time of concentration multiplied by a runoff coefficient (C). A is the area in acres. C is dependent on the soil infiltration rate (f), the ratio of ground surface area that is impervious to infiltration (a), and the rainfall intensity. This relationship is expressed by the equation:

$$C = .85\left(1-f\left(\frac{1-a}{I}\right)\right)$$

The factor .85 accounts for a minimum of 15 percent of the rainfall that is lost due to surface depression and the adsorption of surface moisture on soil and ground particles. The values used in this study for 'f' and 'a' are shown in Table 3-1:

TABLE 3-1. RUNOFF FACTORS

f - Infiltration Rate

| | 10-year Storm | 100-year Storm |
|---|---|---|
| Soil Group B | .52 in/hr | .32 in/hr |
| Soil Group D | .31 in/hr | .16 in/hr |

a - Impervious Percentage

| Hydrologic Land Use | (a x 100) |
|---|---|
| Park (1 unit/Ac) | 20 |
| School (2 unit/Ac) | 40 |
| Single family (3-8/units/Ac) | 45 |
| Multi-family (9 or more units/Ac) | 80 |
| Commercial | 95 |

The procedure for determining peak discharges by the rational method for the 10-year flood is described in Section VIII of the Hydrology Manual of the Orange County Flood Control District (now the Environmental Management Agency). The only departure from that method is the inclusion of independent subarea discharges which were calculated throughout. The Hydrology Manual does not describe methods of determining the 100-year peak discharge using the rational method. Peak discharges for the 100-year flood are based on rational method procedures identical to those for determining the 10-year flood except that infiltration and rainfall rates corresponding to the 100-year flood are used. A master plan study of this nature is concerned with maximum discharges at all points; thus a 30 percent limitation placed on subareas before treating them as independent area as specified by the Manual, would not be appropriate.

In accordance with the U.S. Soil Conservation Service National Engineering Handbook, Section 4, differing moisture conditions were assumed for the different flood frequencies. For the 10-year flood, Antecedent Moisture Condition II (AMC II) was used, (the average of the conditions preceding the occurrence of the maximum annual flood). For the 100-flood, AMC III

was used (assumes five days of heavy rainfall previous to the given flood, and near saturation of the soil). Both conditions effect the differing infiltration rates given in Table 3-1.

## HYDRAULICS

Throughout the study area, reinforced concrete pipe was assumed for the recommended system. An underground system is generally preferred to handle moderate flows in urban developments due to the high cost of right-of-way and maintenance. However, in rural areas, and in undeveloped parcels planned for low-density housing, other methods of stormwater conveyance may be more appropriate. Where deviation from the underground system should be considered, such recommendations are included in tables of recommended facilities.

The pipes were sized to flow full but not under pressure, resulting in a hydraulic grade line coincident with the pipe soffit. Manning's equation, $Q = \frac{1.486}{n} \times AR^{2/3} S^{1/2}$, was used throughout with the friction coefficient n =.013. The friction slope, S, was set equal to the existing ground slope. Where the slope was adverse, a minimum grade of 0.002 was used. In rural and undeveloped sections where steep natural slopes were encountered, the friction slope was limited to 0.10. Minor energy losses due to manholes, bends, junctions, and transitions were not considered. Catch basins and connector pipes were not sized.

## COST ESTIMATE

The unit costs used in this study were based on data used by PRC Toups in calculating construction costs. They were updated to January 1981 using the Engineering News-Record Los Angeles construction cost index of 4079.5.

When applied to reinforced concrete pipe, regression analysis revealed that the costs fitted closely to the relationship:

$$P = .417D^{1.4}$$

Where:

P = Cost in dollars per lineal foot for RCP in place including all earthwork, shoring, and paving.

D = Inside diameter of pipe in inches.

This equation was used to determine unit prices for pipe. Manholes or Junction Structures were assumed to occur every 400 feet regardless of pipe size and were estimated at $1,800 each. In addition, engineering and

administrative costs were assumed to be 15 percent of the construction cost with a contingency of 15 percent of the total cost added to each system. Detailed estimates are included in the Appendix.

In order to update these estimates from time to time, comparisons with the actual ENR Los Angeles construction cost index may be used.

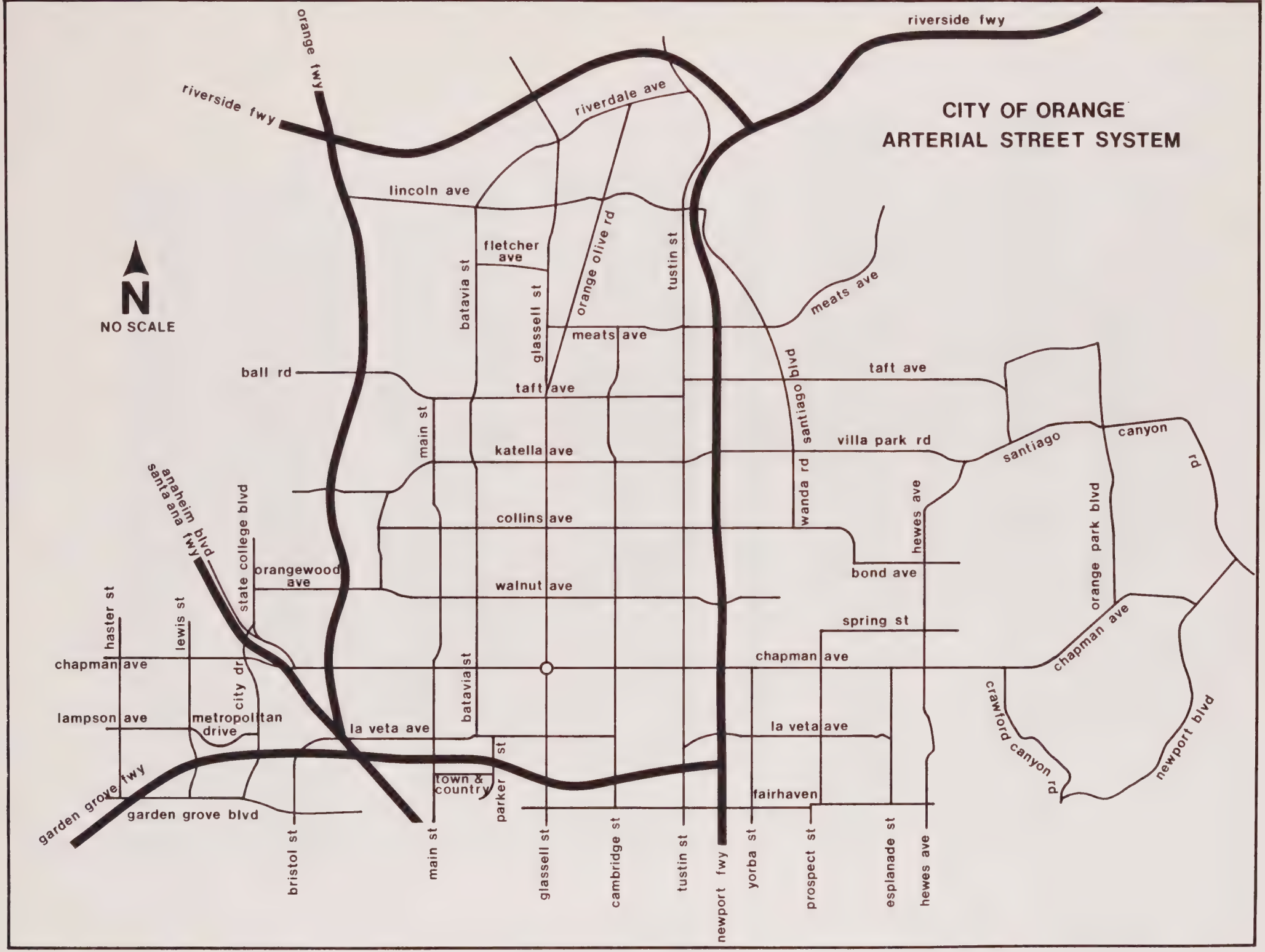

CITY OF ORANGE
ARTERIAL STREET SYSTEM
N
NO SCALE
riverside fwy
orange fwy
riverside fwy
riverside fwy
riverdale ave
lincoln ave
fletcher ave
batavia st
glassell st
orange olive rd
tustin st
meats ave
meats ave
ball rd
taft ave
taft ave
main st
santiago blvd
villa park rd
katella ave
santiago
canyon rd
wanda rd
hewes ave
orange park blvd
collins ave
anaheim blvd
santa ana fwy
state college blvd
orangewood ave
walnut ave
bond ave
haster st
lewis st
spring st
chapman ave
chapman ave
chapman ave
city dr
batavia st
crawford canyon rd
lampson ave
metropolitan drive
la veta ave
la veta ave
newport blvd
garden grove fwy
town & country
parker st
fairhaven
garden grove blvd
bristol st
main st
glassell st
cambridge st
tustin st
newport fwy
yorba st
prospect st
esplanade st
hewes ave

PLATE 3

# CHAPTER 4

## EXISTING REGIONAL DRAINAGE FACILITIES

Within the city limits of Orange and its study area are facilities under the jurisdiction and operation of other agencies. These regional facilities, which generally extend through more than one city or have a drainage area larger than 500 acres, are briefly described below.

### U.S. ARMY CORPS OF ENGINEERS

The Santa Ana River and Prado Dam in Riverside County are maintained by the Corps of Engineers. This system is adequate only for floods having return periods up to 70 years. During the 100-year flood, the banks will be overtopped causing flooding adjacent to the river.

### ORANGE COUNTY ENVIRONMENTAL MANAGEMENT AGENCY

1. Santiago Creek and Villa Park Dam E08 - Santiago Creek is the major tributary to the Santa Ana River in Orange County. It is a natural stream with some bank stabilization along the lower reaches. Villa Park Dam controls the flow upstream from the City. Based on the Orange County EMA Control Manual for Villa Park Dam, a peak flow of 6000 cfs will be released during the 100-year flood. In spite of this control, the 100-year flow will overtop the banks of the Creek at a few locations.

2. Alameda Storm Channel E08S02 - This rectangular concrete channel runs through tracts of homes in the vicinity of Hewes Avenue and Santiago Canyon Road. The channel was constructed in the 1930's and, like most of the storm drainage construction of that era, lacks capacity to transport 100-year runoff under present conditions. It is adequate for a 10-year to 25-year flood, but flows of higher magnitude will overtop the walls and street crossings.

3. Handy Creek E08S02 - This trapezoidal earth channel with drop structures extends from Chapman Avenue to Amapola Road in the Orange Park Acres area of the City. This channel is designed for a 25-year flood and can convey the 100-year flood without endangering adjacent structures. There is some overbank flow at Amapola Road and Chapman Avenue during the 100-year flood event caused by road-crossing constrictions at these locations.

   Between Amapola Road and the Alameda Storm Channel, Handy Creek is in unincorporated territory and unimproved in this reach. Extensive vegetation within the waterway causes the 100-year flow to overtop the banks.

4. El Modena-Irvine Channel F07 - This concrete conduit begins as an underground system south of Chapman Avenue and becomes an open rectangular channel in the vicinity of Hewes Avenue. Between Hewes Avenue and Jordan Avenue, a retarding basin is used to reduce the peak discharge of high flows while allowing low flows to continue unabated. South of the retarding basin, the system becomes a rectangular channel again. The system is adequate for 100-year flood flows.

5. Marlboro Channel E07S01 - This is a rectangular concrete channel between the Collins Channel and the Newport Freeway, which is adequate to convey the 100-year flood.

6. Bitterbush Channel E11 - This trapezoidal channel is concrete-lined from the Santa Ana River to Eckhoff Street. From Eckhoff Street to Collins Avenue the channel is unlined. The 100-year flow is contained within the channel; however, constriction at the Sycamore Avenue culvert causes overflow and local street flooding.

7. Collins Channel E07 - This is a graded, trapezoidal earth channel extending from the Santa Ana River to Orange-Olive Road. Downstream of Glassell Street 340 cfs of the 1900 cfs total 100-year flow will overtop the channel banks, cause limited flooding, then return to the channel just upstream of the Southern Pacific Railroad tracks. Downstream of the confluence with Marlboro Channel, the increased flow exceeds the channel capacity and approximately 700 cfs overtops the banks. Since banks are higher than the adjacent property, none of the overflow will return to the channel until after the peak flow has passed and the overflow re-enters via the street drainage system.

   A relatively small (200 cfs) breakout will occur between Katella Avenue and Struck Avenue and results in shallow flooding. Downstream from this point, the peak flow in the channel is reduced sufficiently to prevent further breakouts.

8. Buckeye Storm Channel E07S03 - This channel begins at the Newport Freeway and proceeds westerly to Glassell Street. From that point to the Santa Ana River, it is known as Collins Channel. The 100-year flow is contained from the upstream end to Shaffer Street. Downstream of Shaffer Street, the flow increases, exceeding channel capacity. Approximately 400 cfs overflows between Shaffer Street and Orange-Olive Road. An additional 300 cfs escapes at Orange-Olive Road due to the undersized conduits beneath the road. All of the overflow results in flooding during the 100-year flood.

9. Fletcher Channel and Retarding Basin E10 - Fletcher Channel is a trapezoidal channel (concrete-lined at the downstream reach with some unlined portions upstream of the retarding basin) extending from the Santa Ana River upstream to Orange-Olive Road. It is of adequate size to contain the 100-year flood.

10. La Veta Avenue Storm Drain E08P01 - This underground conduit in La Veta Avenue extends from Santiago Creek easterly to Chipwood Avenue. It is a box-shaped structure with an arch roof constructed during the 1930's. It is incapable of handling present runoff even for the 10-year flood.

11. Chapman Avenue Drain E08P06 - This is a reinforced concrete pipe conduit in Chapman Avenue from Santiago Creek to just west of Esplanade Avenue. It was designed by the County for a 25-year frequency flood flow. When combined with the street capacity, it is capable of carrying the 100-year flood.

12. Holiday Storm Drain - This reinforced concrete pipe conduit extends in Chapman Avenue from the Santa Ana Freeway westerly to EMA facility C05. This system was designed for flows constituting 70 percent of the 10-year runoff. Consequently, it is not considered adequate for either the 10-year or 100-year flood.

13. Walnut Avenue Storm Drain - This is an open, unlined trapezoidal channel from Santiago Creek easterly from Walnut Avenue to Rancho Santiago Boulevard. In the past, this drain generally had been regarded as being insufficient to convey large storm flows. However, recent construction will result in diverting some runoff from this channel, which will have a positive impact on the channel's capacity. Study and analysis of the new drainage patterns tributary to this system were beyond the scope of this study.

## EXISTING LOCAL FACILITIES

Local, city-owned facilities are generally designed to carry 10-year flood flows. The existing system was described in detail in the Deficiency Report submitted at the conclusion of Phase I and will not be reconsidered here. This report is on file at the Department of Public Works and can be referred to for detailed information on hydrology and sizing of the present system.

In general, it was found that the facilities constructed prior to 1940 are insufficient to handle the runoff from an urban population which has grown ten-fold in the past forty years. The drainage systems constructed in the 1950's and 60's, during rapid City expansion, for the most part are adequate. These drains were designed using the modified rational method based on assumed ultimate development, thus taking into account the effect of future land use.

An unusual element of the City's present system is a 60-inch concrete line which begins at Eisenhower Park in the northern portion of the City and runs almost due south to Santiago Creek. It was originally constructed by the Santa Ana Valley Irrigation (S.A.V.I.) Company as the main feeder pipe to carry irrigation water to the orchards and farms in the City. As

urbanization led to the elimination of agriculture, the irrigation line was no longer needed. The City took over the entire S.A.V.I. system and incorporated the 60-inch main line into its storm drainage system where physically feasible.

# CHAPTER 5

# PROPOSED DRAINAGE FACILITIES

## FACILITIES PLANNED BY OTHER AGENCIES

At the present time, the only plans the Orange County Environmental Management Agency (OCEMA) has for constructing stormwater facilities are along Handy Creek and Santiago Creek. A diversion structure is planned along Handy Creek upstream of the Alameda Storm Channel. This reach has been described in Chapter 4. Construction of this diversion, designed for the 100-year flood, will alleviate potential flooding from the storm channel downstream. Negotiations for the diversion structure's right-of-way are currently underway.

A Master Plan by OCEMA has been prepared for the ultimate use of Santiago Creek. It proposes upgrading the creek bottom, bank stabilization, and multi-use of the channel right-of-way. These plans are dependent upon the cessation of sand and gravel operations currently underway within the creek and thus will not be implemented for a number of years.

The U.S. Army Corps of Engineers has developed an overall plan for improving the Santa Ana River and Santiago Creek. It is a 0.8 billion dollar project involving construction of a new dam in San Bernardino County, increasing the capacity of Prado Dam, and constructing levees on the Santa Ana River in addition to improvements within Santiago Creek. This is a long-term project scheduled for final completion in the 1990's.

## PROPOSED DRAINAGE FACILITIES

The purpose of this Master Plan of Drainage is to provide the City of Orange with a comprehensive plan of proposed facilities which will, upon their implementation, relieve the study area of periodic flooding. The Master Plan also furnishes a priority system for construction, cost estimates of facilities, and recommendations for financing of construction.

As described in Chapter 3, an overall system was developed to provide flood mitigation in the developed areas of the City. The recommended Master Plan is presented on Plate 4.

The drainage system was sized to bring the water surface down to the point where the conditions indicated on Plate 2 are satisfied. Water surface elevations were reduced until the first floors were no longer subject to flooding. For example, if the deficiency study indicated that for a 100-year storm the first floor was flooded to a depth of 0.4 feet, then a drainage facility would be designed to reduce the water surface elevation by that amount. Similarly, 10-year flooding was reduced until it could be

confined between the curb faces of the street section under consideration. No attempt was made to remove all the flood waters from the surface and carry it underground, since this usually is not economically justifiable. As a practical matter, and due to the flat topography of much of the City, the flow-carrying capacity of streets was limited in proportion to the volume of runoff. This was especially true in the north-south streets of the central area where the grades are often adverse to the flow.

The arterial street system of the study area is indicated on Plate 3. The 10-year flow-carrying area of these streets was limited to the outside 20 feet on each side and, depending upon the street width, left a minimum of one 12-foot lane to a maximum of 25 feet in each direction free from flooding.

Each proposed drainage system in developed portions of the study area was assigned a priority number from 1 to 5. Priority 1 was assigned to those systems which would alleviate a significant area of widespread flooding in the high-density areas of the City. Areas of lesser potential damage were assigned lower priorities. Priority 5 represents local flooding in low-density residential locations. Drainage systems in the undeveloped portions of the study area were not assigned priority numbers. It was assumed that they would be built as development takes place.

PRIORITY 1 - These are areas of potentially serious flooding. They are located in the high density, commercial and business center of the City. With the exception of the Chapman Avenue Drain (5-4), these facilities are proposed to augment older, outmoded drains.

PRIORITY 2 - Includes additional facilities needed to alleviate serious flooding and should be addressed once Priority 1 needs are satisfied.

PRIORITY 3 - These are areas of flooding in commercial and residential locations. They are not as widespread as those represented by the first two priorities but could cause property damage and traffic disruption.

PRIORITY 4 - These facilities will alleviate local flooding in arterial streets.

PRIORITY 5 - These facilities represent the lowest priority. They will reduce local flooding in non-arterial streets. Projects of this nature are usually financed from City General Funds on an as-available basis.

Tables 5-1 and 5-2 present the total estimated cost for each proposed system arranged by priority number. Listing of the facilities within each priority are strictly on a numerical basis and do not represent any particular ranking scheme.

The tables at the end of this report (Appendix A) describe the recommended Master Drainage Plan facilities in detail and include cost breakdown.

TABLE 5-1. TOTAL ESTIMATED PROJECT COST OF MASTER DRAINAGE PLAN FACILITIES [a]

| Priority | Project Cost |
|---|---|
| 1 | $ 4,319,000 |
| 2 | 3,018,000 |
| 3 | 3,961,000 |
| 4 | 2,191,000 |
| 5 | 1,636,000 |
| Undeveloped Areas | 14,197,000 |
| Total | $29,322,000 |

[a] ENR CCI (L.A.) = 4079.5 (January 1981)

Project costs include 15% for Administration and Engineering and 15% for Construction Contingencies.

TABLE 5-2. SUMMARY OF COSTS [a]

| Facility Area Number | Page Reference Number | Total Project Cost |
|---|---|---|
| PRIORITY 1 | | |
| 5-4 | 32 | $ 1,170,000 |
| 9-1 | 33 | 691,000 |
| 9-2 | 34 | 812,000 |
| 16-10 (portion) | 35 | 1,646,000 |
| TOTAL | | $ 4,319,000 |
| PRIORITY 2 | | |
| 10-1 (portion) | 36 | $ 348,000 |
| 13-2 | 37 | 298,000 |
| 16-10 (portion) | 38 | 477,000 |
| 20-1 (portion) | 39 | 1,331,000 |
| 21-5 | 40 | 564,000 |
| TOTAL | | $ 3,018,000 |
| PRIORITY 3 | | |
| 6-6 | 41 | $ 506,000 |
| 8-1 | 42 | 235,000 |
| 10-1 (portion) | 43 | 460,000 |
| 10-2 | 44 | 236,000 |
| 12-1 | 45 | 200,000 |
| 13-1 | 46 | 553,000 |
| 14-4 | 47 | 338,000 |
| 16-1 | 48 | 68,000 |
| 16-2 | 49 | 117,000 |
| 16-10 (portion) | 50 | 283,000 |
| 22-4 | 51 | 104,000 |
| 22-5 | 52 | 113,000 |
| 30-3 | 53 | 748,000 |
| TOTAL | | $ 3,961,000 |

[a] ENR CCI (L.A.) = 4079.5 (January 1981)
Project cost includes 15% for Administration and Engineering and 15% for construction contingencies

TABLE 5-2. SUMMARY OF COSTS (Continued) [a]

| Facility Area Number | Page Reference Number | Total Project Cost |
|---|---|---|
| PRIORITY 4 | | |
| 2-2 | 54 | $ 90,000 |
| 2-3 | 54 | 25,000 |
| 4-1 | 55 | 58,000 |
| 6-5 | 56 | 152,000 |
| 6-6 | 57 | 73,000 |
| 6-7 | 58 | 250,000 |
| 6-8 | 59 | 73,000 |
| 7-1 | 60 | 206,000 |
| 7-2 | 61 | 42,000 |
| 12-2 | 62 | 165,000 |
| 13-3 | 63 | 34,000 |
| 16-5 | 64 | 149,000 |
| 16-8 | 65 | 185,000 |
| 16-10 (portion) | 66 | 63,000 |
| 19-1 | 67 | 172,000 |
| 20-5 | 68 | 78,000 |
| 23-2 | 69 | 86,000 |
| 23-5 | 69 | 80,000 |
| 23-6 | 70 | 46,000 |
| 24-3 | 70 | 76,000 |
| 37-1 | 71 | 88,000 |
| TOTAL | | $ 2,191,000 |
| PRIORITY 5 | | |
| 13-4 | 72 | $ 54,000 |
| 16-10 (portion) | 72 | 42,000 |
| 16-10 (portion) | 73 | 38,000 |
| 23-2 | 73 | 50,000 |
| 23-3 | 74 | 87,000 |
| 23-4 | 74 | 51,000 |
| 23-6 | 75 | 38,000 |
| 24-4 | 75 | 27,000 |
| 31-1 | 76 | 214,000 |
| 35-2 | 77 | 197,000 |
| 37-3 | 77 | 47,000 |
| 37-6 | 78 | 442,000 |
| 38-2 | 79 | 349,000 |
| TOTAL | | $ 1,636,000 |

[a] ENR CCI (L.A.) = 4079.5 (January 1981)
Project cost includes 15% for Administration and Engineering and 15% for Construction Contingencies

TABLE 5-2. SUMMARY OF COSTS (Continued) [a]

| Facility Area Number | Page Reference Number | Total Project Cost |
|---|---|---|
| UNDEVELOPED AREAS | | |
| 20-1 (portion) | 80 | $ 148,000 |
| 30-2 | 80 | 583,000 |
| 34-2 | 81 | 50,000 |
| 34-3 | 82 | 37,000 |
| 34-4 | 82 | 90,000 |
| 34-5 | 83 | 191,000 |
| 36-1 | 83 | 376,000 |
| 36-2 | 84 | 62,000 |
| 39-3 | 84 | 83,000 |
| 39-5 | 85 | 368,000 |
| 39-6 | 86 | 501,000 |
| 39-7 | 87 | 44,000 |
| 39-8 | 87 | 258,000 |
| 39-9 | 88 | 149,000 |
| 43-1 | 89 | 998,000 |
| 44-1 | 90 | 328,000 |
| 44-2 | 91 | 525,000 |
| 44-3 | 92 | 255,000 |
| 45-1 | 92 | 86,000 |
| 45-2 | 93 | 62,000 |
| 45-3 | 93 | 50,000 |
| 46-1 | 94 | 3,717,000 |
| 46-1 | 95 | 1,498,000 |
| 46-1 | 97 | 957,000 |
| 46-2 | 98 | 334,000 |
| 46-2 | 98 | 483,000 |
| 46-3 | 99 | 33,000 |
| 52-1 | 99 | 364,000 |
| 53-1 | 100 | 109,000 |
| 53-2 | 100 | 177,000 |
| 53-3 | 101 | 281,000 |
| TOTAL | | $14,197,000 |

[a] ENR CCI (L.A.) = 4079.5 (January 1981)
Project cost includes 15% for Administration and Engineering and 15% for Construction Contingencies

# CHAPTER 6

# IMPLEMENTATION

## METHODS OF FINANCING

### GENERAL

Over the years, local sources have financed the major portion of construction for urban storm drains. A variety of resources, i.e., tax exempt bonds, special assessments, appropriations from general tax revenues, etc., have been utilized depending upon particular legislative constraints. More recently, federal and state aid grants and loan programs were established providing some degree of financial assistance. In view of the increasing difficulty of obtaining public approval on bond issues and other local tax increases, revenue sharing has become an alternate method of funding public works.

Some methods of joint funding are described below:

### PUBLIC WORKS AND DEVELOPMENT FACILITIES

(Public Works and Economic Development Act of 1965, as amended through 1971.)

This is a federal program administered by the Economic Development Administration (Department of Commerce) for public works projects, including flood control, for economically stressed areas with a high rate of unemployment.

Under Title I, grants provide fifty percent (50%) of project cost. Supplementary grants may cover 100 percent of project cost in special areas under prescribed conditions.

Under Title II, funding is provided through loans when other resources are not available. The amount of the loan when combined with other available funds must be sufficient to assure project completion. The repayment period cannot exceed 40 years.

### FEDERAL HOUSING AND COMMUNITY DEVELOPMENT ACT OF 1974

The Housing and Community Development Act of 1974 includes provisions of Federal grants for community development of storm drain construction.

The proposed construction must eliminate or prevent slums and blighted areas and provide improved community facilities.

The grant application must also contain a housing assistance plan which surveys the City's housing stock and specifies annual housing goals for all groups of the community.

## ORANGE COUNTY ENVIRONMENTAL MANAGEMENT AGENCY COOPERATIVE FUNDING

Each year the Orange County EMA provides a limited amount of funds which are allocated through the City Engineer's Flood Control Advisory Committee (CEFCAC) for local drainage projects within the various cities and county areas. These funds either finance the complete project or provide, on a cooperative basis with the City, approximately 50 percent or more of the funds necessary to construct the proposed drainage facility. Cooperative funding is therefore available from the EMA through this committee. However, due to the recent enactment of laws limiting the amount of property tax revenues, this funding source is becoming increasingly difficult to obtain.

## HIGHWAY IMPROVEMENT PROJECTS

The County of Orange, through its Arterial Highway Financing Program, and the State of California, through its general state road system program, both include in street improvement projects certain aspects of drainage systems, provided the latter render the highway free from excess flooding during major storms. A portion of the necessary funding for storm drain facilities construction through their agencies is possible, when combined with a highway improvement project. The matching share is 25 percent of the total storm drain cost applicable to roadway construction. Gas tax monies directly coming to the City may be used, under certain conditions, to finance a portion, or all of a selected drainage facility. Careful consideration should be given to the advisability of including a portion of related storm drain systems in any highway project, if the storm drain system can meet the conditions established by the State Controller for expenditure of gas tax monies.

## LOCAL FUNDING

The City may wish to finance some projects entirely out of its own funds or to establish drainage fee areas in currently undeveloped portions. The following are some methods by which this may be done:

### Improvement Act of 1911 and 1913

These acts provide for the formation of special assessment districts and require citizens' approval within the proposed Districts. The relatively high cost of constructing and maintaining most major storm drain facilities, (in contrast to local sewer and street assessment district projects) and the maximum 10-year period for bond redemption, may be unsatisfactorily high to benefitting property owners. This act, therefore, may be unsuitable for drainage improvements, with the exception of those requiring modest construction costs having limited service areas.

## City General Fund

Another source of funds which can be used for drainage facility construction is the City's general fund. The heavy demand on this limited amount of revenue, however, has relegated construction of drainage systems to a low priority status when compared to other more immediate City needs.

## Special Drainage Area Fees - Subdivision Map Act

Fees may be collected for payment of drainage facility costs if the City determines that development or redevelopment of property within a planned special drainage area will require construction of such facilities. These fees may be charged and collected as a condition prior to development of such property. A building permit may be denied until the fee is paid. The developer may, at his sole cost and expense, install City-approved drainage facilities in any special drainage area or the City may install them with funds supplied by the developer. The City may further reimburse a developer for that portion of facility costs which may be attributable to oversizing of the improvement above and beyond the drainage requirements which the developed property itself would entail.

The City presently has established drainage fees in some parts of the study area. When development occurs within these designated areas, a fee is charged based on the acreage of the development. As part of the scope of work, these fees were examined taking into consideration the facilities proposed as part of this report. In addition to these existing drainage fee areas (A through H), this study proposes additional Areas I through X as shown on Plate 5. Table 6-1 summarizes the acreage and fees of the proposed areas and those existing areas where updating is recommended. These fees were developed by dividing the total estimated cost of the facilities by the acreage of the drainage area served by the stormwater system. In calculating costs, only RCP storm drains 36 inches or greater in diameter were included, while smaller drains were considered local improvements to be included in the cost of future individual developments which will receive the benefits exclusively. It is also recommended that these fees be reviewed on an annual basis and updated when necessary. Basing the fees on the current Engineering News Record Los Angeles construction index will keep the fees in line with current costs.

TABLE 6-1. DRAINAGE AREA ASSESSMENT FEES (January 1981)

Revised drainage fees are recommended for the following existing areas in order to reflect current construction costs based on the Jan 1981 ENR CCI (L.A.) = 4079.5.

| Area No. | Revised Fee in $/Acre |
|---|---|
| A | $ 924 |
| B | 835 |
| C | 1,783 |
| D | 2,146 |
| E | 453 |
| G | 2,218 |
| H | 1,014 |

Proposed new drainage assessment areas.

| Proposed Area No. | Area in Acres | Total Facility Cost | Fee in $/Acre |
|---|---|---|---|
| I | 123 | $ 49,000 | $ 398 |
| II | 129 | 93,000 | 721 |
| III | 118 | 123,000 | 1,042 |
| IV | 523 | 643,000 | 1,229 |
| V | 1,993 | 5,060,000 | 2,539 |
| VI | 593 | 1,685,000 | 2,841 |
| VII | 143 | 180,000 | 1,259 |
| VIII | 388 | 303,000 | 781 |
| IX | 694 | 1,328,000 | 1,914 |
| X | 269 | 348,000 | 1,294 |
| F* | 622 | 1,183,000 | 1,902 |
| TOTAL | 5,595 | 11,117,000 | 1,987 Average |

*Recommended revision of existing drainage area boundary.

# APPENDIX A

## APPENDIX A

### TABLE DESCRIPTIONS

The tables are arranged according to priority. Table A-1 includes all those facilities with a priority rating of 1. Table A-2 describes facilities with a priority rating of 2, and so on to Table A-5. Table A-6 lists those facilities in undeveloped areas.

Column 1 - Facility Area Number: These numbers are referenced to the City's Drainage Maps designated D-77. These are 200-scale maps numbered from 1 to 68 showing topography, elevations, contour lines, improvements, and the size and location of existing and proposed drainage facilities. The first number indicates the sheet containing the major portion of the drainage area, usually the downstream reach. The second number differentiates between systems on the same sheet. Below the facility number, a listing is made of all sheets upon which the facility appears.

Column 2 - Facility Location and Description: This is a summary of the system which includes the name of the street, where available, and size of the conduit. All these descriptions begin at the downstream end of the facility and proceed upstream.

Column 3 - Design Flow: Unless otherwise noted, these discharges are 10-year frequency flows. This is the flow actually carried in the pipe. The number in parenthesis represents the total direct runoff along the particular reach. The difference between the two represents the amount carried in the street and existing facilities. In all cases, 100-year flood protection is provided.

Column 4 - Cost Estimate: These are rounded to the nearest hundred dollars and represent estimated costs as of January 1981 (ENR (L.A.) CCI = 4079.5). Total project costs were increased 15% to cover minor additional construction cost for each project.

Column 5 - Remarks: Any unusual features, alternate routes or facilities are mentioned.

**TABLE A-1**

PRIORITY 1

TABLE A-1.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 5-4 Sheets 5 & 10 | Chapman Ave. Drain - Bitterbush Channel to Batavia St. | | | | |
| | 150 L.F. - 102" RCP | 492 (594) | $271 | $ 40,700 | Major thoroughfare. Consideration should be given to constructing drain along with street improvements. |
| | 2300 L.F. - 72" RCP | 328 (430) | 166 | 381,800 | |
| | 950 L.F. - 69" RCP | 292 (394) | 156 | 148,200 | |
| | 1670 L.F. - 54" RCP | 134 (264) | 111 | 185,400 | |
| | Main Street Chapman Ave. to Maple Ave. | | | | |
| | 700 L.F. - 51" RCP | 60 (146) | 103 | 72,100 | |
| | Eckhoff St. - Bitterbush Ch. to Maple Ave. | | | | |
| | 320 L.F. - 45" RCP | 39 (168) | 86 | 27,500 | |
| | | | Total pipe cost | $ 855,700 | |
| | | | 16 MH @ 1800 | 28,800 | |
| | | | Subtotal | 884,500 | |
| | | | 15% A&E | 132,700 | |
| | | | Subtotal | 1,017,200 | |
| | | | 15% contingency | 152,800 | |
| | | | Total | $1,170,000 | |

TABLE A-1.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 9-1 Sheets 9 & 10 | Glassell St. Drain - La Veta Ave. to Chapman Ave. | | | | |
| | 650 L.F. - 78" RCP | 214 (214) | $186 | $ 120,900 | Extension of existing drain in Glassell St. Alignment between Almond Ave. & Maple Ave. subject to detailed study at time of actual design. This system will need a relief drain in Shaffer St. |
| | 650 L.F. - 78" RCP | 195 (195) | 186 | 120,900 | |
| | 1440 L.F. - 78" RCP | 180 (180) | 186 | 267,800 | |
| | | | Total Pipe Cost | $ 509,600 | |
| | | | 7 MH @ 1800 | 12,600 | |
| | | | Subtotal | $ 522,200 | |
| | | | 15% A&E | 78,300 | |
| | | | Subtotal | $ 600,500 | |
| | | | 15% Contingency | 90,500 | |
| | | | Total | $ 691,000 | |

TABLE A-1.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 9-2 Sheets 10, 11 17, 18 | Cambridge St. Drain.- Chapman Ave. to Everett Pl. | | | | |
| | 600 L.F. - 75" RCP | 198 (198) | $176 | $ 105,600 | Extension of existing sytem. |
| | 660 L.F. - 69" RCP | 164 (164) | 156 | 103,000 | |
| | 650 L.F. - 60" RCP | 120 (120) | 129 | 83,900 | |
| | 670 L.F. - 54" RCP | 90 (90) | 111 | 74,400 | |
| | 1140 L.F. - 24" RCP | 15 (23) | 36 | 41,000 | |
| | Walnut Street | | | | |
| | 670 L.F. - 39" RCP | 70 (70) | 70 | 46,900 | Ties into existing S.A.V.I. line. |
| | Chapman Avenue | | | | |
| | 1300 L.F. - 27" RCP | 26 (41) | 42 | 54,600 | |
| | 840 L.F. - 24" RCP | 10 (26) | 36 | 30,200 | |
| | Palm Avenue | | | | |
| | 950 L.F. - 27" RCP | 23 (80) | 42 | 39,900 | |
| | | | Total pipe cost | $ 579,500 | |
| | | | 19 MH @ 1800 | 34,200 | |
| | | | Subtotal | $ 613,700 | |
| | | | 15% A&E | 92,100 | |
| | | | Subtotal | $ 705,800 | |
| | | | 15% Contingency | 106,200 | |
| | | | Total | $ 812,000 | |

TABLE A-1.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 16-10 Sheets 16, 17, 18 | Tustin St. Drain - Santiago Creek to Walnut Avenue | | | | |
| | 1330 L.F. - 102" RCP | 514 (735) | $271 | $ 360,400 | Existing 4'X4' RCB is to remain in place as part of the drainage system. |
| | 1280 L.F. - 93" RCP | 439 (687) | 237 | 303,400 | |
| | 660 L.F. - 93" RCP | 424 (669) | 237 | 156,400 | |
| | 700 L.F. - 90" RCP | 416 (640) | 227 | 158,900 | |
| | 1300 L.F. - 78" RCP | 279 (490) | 186 | 241,800 | Hydrology used reflects reduction in runoff caused by proposed 51" RCP in Handy St. (see Table A-3). |
| | | | Total pipe cost | $1,220,900 | |
| | | | 13 MH @ 1800 | 23,400 | |
| | | | Subtotal | $1,244,300 | |
| | | | 15% A&E | 186,600 | |
| | | | Subtotal | $1,430,900 | |
| | | | 15% Contingency | 215,100 | |
| | | | Total | $1,646,000 | |

**TABLE A-2**

PRIORITY 2

TABLE A-2.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 10-1 Sheets 10 & 11 | Glassell St. Drain - Chapman Ave. to Sycamore Ave. | | | | |
| | 770 L.F. - 66" RCP | 122 (122) | $147 | $ 113,200 | This is an extension of the proposed drain in Glassell St. recommended in Table A-1. |
| | 650 L.F. - 60" RCP | 102 (108) | 129 | 83,900 | |
| | 660 L.F. - 45" RCP | 48 (48) | 86 | 56,800 | |
| | | Total pipe cost | | $ 253,900 | |
| | | 5 MH @ 1800 | | $ 9,000 | |
| | | Subtotal | | 262,900 | |
| | | 15% A&E | | 39,400 | |
| | | Subtotal | | 302,300 | The alignment from Chapman Avenue to Maple Ave. subject to detailed study at time of actual design. |
| | | 15% Contingecy | | 45,700 | |
| | | Total | | $ 348,000 | |

TABLE A-2.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 13-2 Sheets 13, 14, 20 | Orange-Olive Road - Laterals to existing channel. | | | | |
| | Grove Avenue | | | | |
| | 810 L.F. - 27" RCP | 12 (50) | $42 | $ 34,000 | A graded-earth channel lies between the AT&SFRR and the west side of Orange-Olive Rd. This channel is adequate to convey the 10-year run-off. These laterals carry the runoff across Orange-Olive Road to the earth channel. |
| | Meats Avenue | | | | |
| | 970 L.F. - 36" RCP | 56 (88) | 63 | 61,100 | |
| | 1100 L.F. - 30" RCP | 41 (76) | 49 | 53,900 | |
| | Cumberland Avenue | | | | |
| | 320 L.F. - 45" RCP | 54 (54) | 86 | 27,500 | |
| | 450 L.F. - 24" RCP | 10 (38) | 36 | 16,200 | |
| | Vista del Gaviota | | | | |
| | 260 L.F. - 30" RCP | 14 (14) | 49 | 12,700 | |
| | | Total pipe cost | | $ 205,400 | |
| | | 11 MH @ 1800 | | 19,800 | |
| | | Subtotal | | $ 225,200 | |
| | | 15% A&E | | 33,800 | |
| | | Subtotal | | $ 259,000 | |
| | | 15% Contingency | | 39,000 | |
| | | Total | | $ 298,000 | |

TABLE A-2.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 16-10 Sheets 18, 19 | Tustin Street Drain - Walnut Avenue to Adams Avenue | | | | |
| | 630 L.F. - 60" RCP | 159 (333) | $130 | $ 81,900 | This is an extension of the Tustin street drains in Table A-1. Existing 4'X4' RCB is to remain in place. |
| | 570 L.F. - 57" RCP | 134 (325) | 120 | 68,400 | |
| | 680 L.F. - 51" RCP | 110 (300) | 103 | 70,000 | |
| | 620 L.F. - 48" RCP | 86 (280) | 94 | 58,300 | |
| | 200 L.F. - 36" RCP | 34 (34) | 63 | 12,600 | |
| | 500 L.F. - 30" RCP | 20 (34) | 49 | 24,500 | |
| | 590 L.F. - 24" RCP | 10 (22) | 36 | 21,200 | |
| | 150 L.F. - 24" RCP | 10 (11) | 36 | 5,400 | |
| | | | Total pipe cost | $ 342,300 | |
| | | | 10 MH @ 1800 | 18,000 | |
| | | | Subtotal | $ 360,300 | |
| | | | 15% A&E | 54,000 | |
| | | | Subtotal | $ 414,300 | |
| | | | 15% Contingency | 62,700 | |
| | | | Total | $ 477,000 | |

TABLE A-2.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 20-1 Sheets 19, 20, 27, & 28 | Meats Avenue - SCE R/W Channel No. 2 to Longridge Drive | | | | |
| | 115 L.F. - 84" RCP (Jacked under freeway) | 441 (822) | $763 | $ 87,700 | This is a relief drain paralleling an existing facility. Rapid development in the areas north and east of Santiago Blvd. has generated more runoff than anticipated during design of orginal project. |
| | 250 L.F. - 72" RCP | 400 (822) | 166 | 41,500 | |
| | 1400 L.F. - 63" RCP | 237 (771) | 138 | 193,200 | |
| | 700 L.F. - 60" RCP | 209 (679) | 129 | 90,300 | |
| | 750 L.F. - 45" RCP | 120 (603) | 86 | 64,500 | |
| | 350 L.F. - 42" RCP | 104 (587) | 79 | 27,700 | |
| | 1000 L.F. - 42" RCP | 165 (585) | 79 | 79,000 | |
| | 1200 L.F. - 48" RCP | 274 (446) | 94 | 112,800 | |
| | Taft Avenue Lateral | | | | Modification of the Master Plan of Drainage for the City of Villa Park may cause additional run off tributary to the system. |
| | 1350 L.F. - 45" RCP | 120 (158) | 86 | 116,100 | |
| | 550 L.F. - 45" RCP | 101 (139) | 86 | 47,300 | |
| | 1400 L.F. - 33" RCP | 68 (114) | 56 | 78,400 | |
| | Santiago Boulevard Lateral | | | | |
| | 350 L.F. - 39" RCP | 48 (150) | 70 | 24,500 | |
| | | | Total pipe cost | $ 963,000 | |
| | | | 24 MH @ 1800 | 43,200 | |
| | | | Subtotal | $1,006,200 | |
| | | | 15% A&E | 151,000 | |
| | | | Subtotal | $1,157,200 | |
| | | | 15% Contingency | 173,800 | |
| | | | Total | $1,331,000 | |

TABLE A-2.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 21-5 Sheets 20 & 21 | Tustin - Heim Drain - Buckeye Channel to Mall Way | | | | This system, which relieves the flooding in the area of the Mall of Orange, is dependent upon using the existing 60" S.A.V.I. line as a stormwater conduit. Its capacity is estimated to be 92 cfs. This line is to be disconnected from the upstream portion of the irrigation line at Heim, connected to the existing 26" steel line and proposed 36" RCP in Heim. Catch basins are to be added directly into the 60" line in Canal Street. The S.A.V.I. line will then discharge into the Buckeye Channel. |
| | Tustin Street | | | | |
| | 650 L.F. - 78" RCP | 164 (194) | $186 | $ 120,900 | |
| | 950 L.F. - 63" RCP | 100 (126) | 138 | 131,100 | |
| | 350 L.F. - 45" RCP | 42 (112) | 86 | 30,100 | |
| | 650 L.F. - 27" RCP | 19 (89) | 42 | 27,300 | |
| | Connection of S.A.V.I. line to Buckeye Channel | | | 30,000 | |
| | Heim Avenue | | | | |
| | 1100 L.F. - 36" RCP | 50 (98) | 63 | 69,300 | |
| | | Total pipe cost | | $ 408,700 | |
| | | 10 MH @ 1800 | | 18,000 | |
| | | Subtotal | | $ 426,700 | |
| | | 15% A&E | | 64,000 | |
| | | Subtotal | | $ 490,700 | |
| | | 15% Contingency | | 73,300 | |
| | | Total | | $ 564,000 | |

## TABLE A-3

PRIORITY 3

TABLE A-3.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 6-6 Sheets 6 & 11 | Walnut Ave. Drain - Bitterbush Channel to Harwood St. | | | | This is an extension and upgrading of the existing system in Walnut Ave. |
| | 700 L.F. - 42" RCP | 74 (156) | $79 | $ 55,300 | |
| | 670 L.F. - 42" RCP | 86 (102) | 79 | 52,900 | |
| | 650 L.F. - 39" RCP | 70 (96) | 70 | 45,500 | |
| | 680 L.F. - 24" RCP | 5 (27) | 36 | 24,500 | |
| | Shaffer Street | | | | |
| | 600 L.F. - 36" RDCP | 24 (59) | 63 | 37,800 | |
| | 350 L.F. - 30" RCP | 16 (51) | 49 | 17,200 | |
| | Glassell Street | | | | |
| | 660 L.F. - 36" RCP | 41 (54) | 63 | 41,600 | |
| | 350 L.F. - 36" RCP | 39 (51) | 63 | 22,100 | |
| | Batavia Avenue | | | | |
| | 1020 L.F. - 33" RCP | 34 (37) | 56 | 57,100 | |
| | | | Total pipe cost | $ 354,000 | |
| | | | 16 MH @ 1800 | 28,800 | |
| | | | Subtotal | $ 382,800 | |
| | | | 15% A&E | 57,400 | |
| | | | Subtotal | $ 440,200 | |
| | | | 15% Contingency | 65,800 | |
| | | | Total | $ 506,000 | |

TABLE A-3.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 8-1<br>Sheets 8 & 13 | Taft Ave. Drain. -<br>Main St. to Batavia St.<br>North on Batavia St. | | | | This is an extention of the existing drain in Taft Avenue. |
| | 1550 L.F. - 42" RCP | 42 (57) | $79 | $ 122,500 | |
| | 520 L.F. - 30" RCP | 25 (42) | 49 | 25,500 | |
| | 400 L.F. - 27" RCP | 15 (25) | 42 | 16,800 | |
| | | | Total pipe cost | $ 164,800 | |
| | | | 7 MH @ 1800 | 12,600 | |
| | | | Subtotal | $ 177,400 | |
| | | | 15% A&E | 26,600 | |
| | | | Subtotal | $ 204,000 | |
| | | | 15% Contingency | 31,000 | |
| | | | Total | $ 235,000 | |

TABLE A-3.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 10-1 Sheets 9 & 10 | Shaffer St. Relief Drain. - Santiago Creek to Chapman Ave. East on Chapman to Harwood Street. | | | | This system is a relief drain to prevent overloading of the proposed Glassell St. drain. (See Table A-1, Area 9-1) |
| | 1180 L.F. - 54" RCP | 80 (80) | $111 | $ 131,000 | |
| | 1310 L.F. - 48" RCP | 48 (48) | 94 | 123,100 | |
| | 660 L.F. - 42" RCP | 32 (32) | 79 | 52,100 | |
| | 650 L.F. - 24" RCP | 4 (17) | 36 | 23,400 | |
| | | | Total pipe cost | $ 329,600 | |
| | | 10 MH @ 1800 | | 18,000 | |
| | | | Subtotal | $ 347,600 | |
| | | 15% A&E | | 52,100 | |
| | | | Subtotal | $ 399,700 | |
| | | 15% Contingency | | 60,300 | |
| | | | Total | $ 460,000 | |

TABLE A-3.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 10-2 Sheets 10 & 11 | Batavia St. Drain. - Chapman Ave. to Sycamore Ave. | | | | This system is both a relief drain for the existing Batavia St. and an extension of the Chapman Ave. Drain. Flows that originally went southerly to the Santiago Creek are partially diverted to the Bitterbush Channel. This provides enough relief to enable the existing drain south of Chapman Ave. to convey the remainder of the runoff. |
| | 650 L.F. - 54" RCP | 107 (169) | $111 | $ 72,200 | |
| | 650 L.F. - 48" RCP | 70 (115) | 94 | 61,100 | |
| | 650 L.F. - 33" RCP | 27 (71) | 56 | 36,400 | |
| | | | Total pipe cost | $ 169,700 | |
| | | 5 MH @ 1800 | | $ 9,000 | |
| | | | Subtotal | $ 178,700 | |
| | | 15% A&E | | 26,800 | |
| | | | Subtotal | $ 205,500 | |
| | | 15% Contingency | | 30,500 | |
| | | | Total | $ 236,000 | |

TABLE A-3.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 12-1 Sheets 12 & 19 | Katella Ave. Laterals - | | | | These are laterals to an existing drain in Katella Ave. Construction of these drains relieves flooding which travels via the street system westerly to Struck Ave. |
| | Glassell Street | | | | |
| | 460 L.F. - 51" RCP | 70 (100) | $103 | $ 47,400 | |
| | 400 L.F. - 36" RCP | 30 (69) | 63 | 25,200 | |
| | 280 L.F. - 27" RCP | 13 (25) | 42 | 11,800 | |
| | Cambridge Street | | | | |
| | 370 L.F. - 33" RCP | 33 (42) | 56 | 20,700 | |
| | 400 L.F. - 27" RCP | 15 (24) | 42 | 16,800 | |
| | Katella Avenue East of California St. | | | | |
| | 520 L.F. - 24" RCP | 19 (40) | 36 | 18,700 | |
| | | | Total pipe cost | $ 140,600 | |
| | | | 6 MH @ 1800 | 10,800 | |
| | | | Subtotal | $ 151,400 | |
| | | | 15% A&E | 22,700 | |
| | | | Subtotal | $ 174,100 | |
| | | | 15% Contingency | 25,900 | |
| | | | Total | $ 200,000 | |

TABLE A-3.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 13-1 Sheets 13 & 20 | Taft Ave. Drain - Collins Channel to Maplewood St. | | | | This system utilizes the existing S.A.V.I. line to pick up the runoff west of Tustin St. This accounts for the large difference between the design flow and the tabled hydrology. |
| | 860 L.F. - 42" RCP | 78 (236) | $79 | $ 67,900 | |
| | 1200 L.F. - 45" RCP | 106 (166) | 86 | 103,200 | |
| | 1070 L.F. - 39" RCP | 69 (146) | 70 | 74,900 | |
| | 870 L.F. - 27" RCP | 28 (98) | 42 | 36,500 | |
| | Taft Ave. S.A.V.I. line to Tustin Street. | | | | |
| | 900 L.F. - 30" RCP | 37 (69) | 49 | 44,100 | |
| | Glassell Street Lateral | | | | |
| | 600 L.F. - 33" RCP | 16 (21) | 56 | 33,600 | |
| | Cambridge Street Lateral | | | | |
| | 780 L.F. - 27" RCP | 19 (41) | 42 | 32,800 | |
| | | | Total pipe cost | $ 393,000 | |
| | | | 14 MH @ 1800 | 25,200 | |
| | | | Subtotal | $ 418,200 | |
| | | | 15% A&E | 62,700 | |
| | | | Subtotal | $ 480,900 | |
| | | | 15% Contingency | 72,100 | |
| | | | Total | $ 553,000 | |

TABLE A-3.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 14-4 Sheets 13 & 14 | Glassell St. Drain. - Collins Channel to Fletcher Ave. | | | | The system is subject to overflow from Fletcher Ave. The Glassell St. drain is sized to prevent any overflow to the west. |
| | 850 L.F. - 42" RCP | 66 (84) | $79 | $ 67,200 | |
| | 440 L.F. - 42" RCP | 51 (73) | 79 | 34,800 | |
| | 750 L.F. - 42" RCP | 51 (66) | 79 | 59,300 | |
| | 480 L.F. - 39" RCP | 34 (49) | 70 | 33,600 | |
| | 410 L.F. - 33" RCP | 22 (37) | 56 | 23,000 | |
| | 600 L.F. - 24" RCP | 9 (23) | 36 | 21,600 | |
| | | | Total pipe cost | $ 239,500 | |
| | | | 9 MH @ 1800 | 16,200 | |
| | | | Subtotal | $ 255,700 | |
| | | | 15% A&E | 38,400 | |
| | | | Subtotal | $ 294,100 | |
| | | | 15% Contingency | 43,900 | |
| | | | Total | $ 338,000 | |

TABLE A-3.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 16-1 Sheet 16 | Fairhaven Avenue - Newport Freeway to City of Santa Ana Drain. | | | | This drain completes the system presently under design by the City of Santa Ana. |
| | 600 L.F. - 42" RCP | 60 (73) | $79 | $ 47,400 | |
| | | 2 MH @ 1800 | | 3,600 | |
| | | Subtotal | | $ 51,000 | |
| | | 15% A&E | | 7,700 | |
| | | Subtotal | | $ 58,700 | |
| | | 15% Contingency | | 9,300 | |
| | | Total | | $ 68,000 | |

TABLE A-3.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 16-2 Sheet 16 | Yorba Street - Fairhaven Avenue to Burdie Lane | | | | |
| | 620 L.F. - 33" RCP | 45 (65) | $56 | $ 34,700 | |
| | 660 L.F. - 30" RCP | 28 (57) | 49 | 32,300 | |
| | 400 L.F. - 24" RCP | 6 (38) | 36 | 14,400 | |
| | | | Total pipe cost | $ 81,400 | |
| | | | 4 MH @ 1800 | 7,200 | |
| | | | Subtotal | $ 88,600 | |
| | | | 15% A&E | 13,300 | |
| | | | Subtotal | $ 101,900 | |
| | | | 15% Contingency | 15,100 | |
| | | | Total | $ 117,000 | |

TABLE A-3.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 16-10 Sheets 17 & 18 | Handy St. Drain - Santiago Creek to Walnut Ave. | | | | This is a relief drain for the Tustin St. drain. It will pickup runoff in order to relieve the Newport Freeway culverts. |
| | 1350 L.F. - 51" RCP | 107 (107) | $103 | $ 139,100 | |
| | 700 L.F. - 36" RCP | 62 (62) | 63 | 44,100 | |
| | 250 L.F. - 42" RCP | 47 (47) | 79 | 19,800 | |
| | | | Total pipe cost | $ 203,000 | |
| | | | 6 MH @ 1800 | 10,800 | |
| | | | Subtotal | $ 213,800 | |
| | | | 15% A&E | 32,100 | |
| | | | Subtotal | $ 245,900 | |
| | | | 15% Contingency | 37,100 | |
| | | | Total | $ 283,000 | |

TABLE A-3.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 22-4 Sheet 21 | Channel No. 5 - Canal St. to Gaff St. | | | | This is a relief drain for 54" RCP west of Canal St. |
| | 1050 L.F. - 39" RCP | 84 (366) | $70 | $ 73,500 | |
| | | 3 MH @ 1800 | | 5,400 | Another possible solution is to construct two retention basins; one at the upstream end of Channel No. 5 just east of Santiago Boulevard, the other at the inlet to the 60" S.A.V.I. line in Eisenhower Park. This S.A.V.I. line could then be tied into Channel No. 5. |
| | | Subtotal | | $ 78,900 | |
| | | 15% A&E | | 11,800 | |
| | | Subtotal | | $ 90,700 | |
| | | 15% Contingency | | 13,300 | |
| | | Total | | $ 104,000 | |
| | | | | | Since the analysis of this system and the sizing of the retarding basins involves hydrograph routing, it is beyond the scope of this study. |

TABLE A-3.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 22-5 Sheets 14, 15 & 22 | Lincoln, Orange-Olive drains - | | | | These drains relieve flooding in the vicinity of Lincoln Ave. & Orange-Olive Rd. |
| | Lincoln Avenue Orange-Olive Road to Anchor Ave. 1150 L.F. - 24" RCP | 17 (45) | $36 | $ 41,400 | An alternative to the drain in Lincoln Ave. would be to locate the facility one block in Main St. Final determination will be made at time of actual design. |
| | Orange-Olive Road Greenleaf Ave. to Lincoln Ave. 560 L.F. - 36" RCP | 48 (62) | 63 | 35,300 | |
| | | | Total pipe cost | $ 76,700 | |
| | | | 5 MH @ 1800 | 9,000 | |
| | | | Subtotal | $ 85,700 | |
| | | | 15% A&E | 12,900 | |
| | | | Subtotal | $ 98,600 | |
| | | | 15% Contingency | 14,400 | |
| | | | Total | $ 113,000 | |

TABLE A-3.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 30-3 Sheets 29 & 30 | Crawford Canyon Drain - South of Chapman | | | | This drain is a lateral to the El Modena-Irvine Channel. |
| | 340 L.F. - 72" RCP | 350 (350) | $166 | $ 56,400 | |
| | 1150 L.F. - 63" RCP | 329 (329) | 138 | 158,700 | |
| | 1200 L.F. - 60" RCP | 294 (294) | 129 | 154,800 | |
| | 900 L.F. - 42" RCP | 147 (156) | 79 | 71,100 | |
| | 1060 L.F. - 39" RCP | 124 (124) | 70 | 74,200 | |
| | 200 L.F. - 24" RCP | 41 (61) | 36 | 7,200 | |
| | Bonita Heights Lateral 400 L.F. - 30" RCP | 64 (90) | 49 | 19,600 | |
| | | | Total pipe cost | $ 542,000 | |
| | | | 13 MH @ 1800 | 23,400 | |
| | | | Subtotal | $ 565,400 | |
| | | | 15% A&E | 84,800 | |
| | | | Subtotal | $ 650,200 | |
| | | | 15% Contingency | 97,800 | |
| | | | Total | $ 748,000 | |

**TABLE A-4**

PRIORITY 4

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 2-2 Sheets 2 & 3 | Anaheim Blvd. - North of State College Blvd. | | | | |
| | 1000 L.F. - 36" RCP | 32 (49) | $63 | $ 63,000 | |
| | | 3 MH @ 1800 | | 5,400 | |
| | | Subtotal | | $ 68,400 | |
| | | 15% A&E | | 10,300 | |
| | | Subtotal | | $ 78,700 | |
| | | 15% Contingency | | 11,300 | |
| | | Total | | $ 90,000 | |
| 2-3 Sheet 2 | Chapman Avenue West of Lewis St. | | | | This drain replaces an existing 12" CMP in Chapman Ave. |
| | 350 L.F. - 30" RCP | 17 (17) | $49 | $ 17,150 | |
| | | 1 MH @ 1800 | | 1,800 | |
| | | Subtotal | | $ 19,000 | |
| | | 15% A&E | | 2,900 | |
| | | Subtotal | | $ 21,900 | |
| | | 15% Contingency | | 3,100 | |
| | | Total | | $ 25,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 4-1 Sheet 4 | La Veta Ave. Drain - at Main St. | | | | This is an extension of an existing drainage system in La Veta Ave. |
| | 650 L.F. - 27" RCP | 22 (43) | $42 | $ 27,300 | |
| | 320 L.F. - 24" RCP | 10 (27) | 36 | 11,500 | |
| | | | Total pipe cost | $ 38,800 | |
| | | 3 MH @ 1800 | | 5,400 | |
| | | | Subtotal | $ 44,200 | |
| | | 15% A&E | | 6,600 | |
| | | | Subtotal | $ 50,800 | |
| | | 15% Contingency | | 7,200 | |
| | | | Total | $ 58,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 6-5 Sheet 6 | Collins Ave. - Eckhoff St. to Main St. | | | | This is an extension of an existing 48" RCP in Collins Ave. |
| | 420 L.F. - 42" RCP | 40 (48) | $79 | $ 33,200 | |
| | 660 L.F. - 36" RCP | 27 (34) | 63 | 41,600 | |
| | 870 L.F. - 24" RCP | 6 (13) | 36 | 31,300 | |
| | | | Total pipe cost | $ 106,100 | |
| | | 5 MH @ 1800 | | 9,000 | |
| | | | Subtotal | $ 115,100 | |
| | | 15% A&E | | 17,300 | |
| | | | Subtotal | $ 132,400 | |
| | | 15% Contingency | | 19,600 | |
| | | | Total | $ 152,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 6-6 Sheet 6 | Main Street Drain. - Lateral to Walnut Ave. Drain. | | | | |
| | 160 L.F. - 42" RCP | 51 (58) | $79 | $ 12,600 | |
| | 210 L.F. - 39" RCP | 33 (40) | 70 | 14,700 | |
| | 620 L.F. - 24" RCP | 7 (15) | 36 | 22,300 | |
| | | | Total pipe cost | $ 49,600 | |
| | | | 3 MH @ 1800 | 5,400 | |
| | | | Subtotal | $ 55,000 | |
| | | | 15% A&E | 8,300 | |
| | | | Subtotal | $ 63,300 | |
| | | | 15% Contingency | 9,700 | |
| | | | Total | $ 73,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 6-7 Sheets 11 & 18 | Collins Ave. Drain. - Shaffer St. to Lincoln St. | | | | This is an extension of the existing Collins Ave. Drain. |
| | 1270 L.F. - 39" RCP | 70 (104) | $70 | $ 88,900 | |
| | 1050 L.F. - 33" RCP | 44 (78) | 56 | 58,800 | |
| | 750 L.F. - 24" RCP | 11 (27) | 36 | 27,000 | |
| | | | Total pipe cost | $ 174,700 | |
| | | | 8 MH @ 1800 | 14,400 | |
| | | | Subtotal | $ 189,100 | |
| | | | 15% A&E | 28,400 | |
| | | | Subtotal | $ 217,500 | |
| | | | 15% Contingency | 32,500 | |
| | | | Total | $ 250,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 6-8 Sheet 6 | Orangewood Ave. - Existing 42" RCP to Eckhoff St. | | | | This is an extension of an existing drain. |
| | 650 L.F. - 42" RCP | 47 (61) | $79 | $ 51,400 | |
| | | 2 MH @ 1800 | | 3,600 | |
| | | Subtotal | | $ 55,000 | |
| | | 15% A&E | | 8,300 | |
| | | Subtotal | | $ 63,300 | |
| | | 15% Contingency | | 9,700 | |
| | | Total | | $ 73,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 7-1 Sheet 7, 8 | Southern Pacific R.R.Drain.- Santa Ana River to North of R.R. on Main St. | | | | |
| | 1100 L.F. - 42" RCP | 81 (81) | $79 | $ 86,900 | |
| | 650 L.F. - 33" RCP | 18 (24) | 56 | 36,400 | |
| | Main St. South of Trenton Ave. | | | | |
| | 340 L.F. - 36" RCP | 18 (25) | 63 | $ 21,400 | |
| | | | Total pipe cost | $ 144,700 | |
| | | 6 MH @ 1800 | | 10,800 | |
| | | | Subtotal | $ 155,500 | |
| | | 15% A&E | | 23,300 | |
| | | | Subtotal | $ 178,800 | |
| | | 15% Contingency | | 27,200 | |
| | | | Total | $ 206,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 7-2 Sheet 7 | Main St. Drain. - Collins Channel to South of Struck Ave. | | | | This is a lateral to the Collins Channel. |
| | 500 L.F. - 33" RCP | 28 (47) | $56 | $ 28,000 | |
| | | 2 MH @ 1800 | | 3,600 | |
| | | Subtotal | | $ 31,600 | |
| | | 15% A&E | | 4,700 | |
| | | Subtotal | | $ 36,300 | |
| | | 15% Contingency | | 5,700 | |
| | | Total | | $ 42,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 12-2 | Cambridge St. Drain. - Channel No. 2 to | | | | |
| Sheet 12 | Katella Ave. | | | | |
| | 400 L.F. - 36" RCP | 32 (42) | $63 | $ 25,200 | |
| | 300 L.F. - 27" RCP | 16 (25) | 42 | 12,600 | |
| | 500 L.F. - 24" RCP | 5 (14) | 36 | 18,000 | |
| | Glassell St. Drain.- Channel No. 2 to Katella Ave. | | | | |
| | 1150 L.F. - 30" RCP | 24 (36) | 49 | 56,400 | |
| | | Total pipe cost | | $ 112,200 | |
| | | 7 MH @ 1800 | | 12,600 | |
| | | Subtotal | | $ 124,800 | |
| | | 15% A&E | | 18,700 | |
| | | Subtotal | | $ 143,500 | |
| | | 15% Contingency | | 21,500 | |
| | | Total | | $ 165,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 13-3 Sheet 13 | Channel No. 8 - South of Grove Ave. on Batavia St. | | | | |
| | 300 L.F. - 42" RCP | 47 (56) | $79 | $ 23,700 | |
| | | 1 MH @ 1800 | | 1,800 | |
| | | Subtotal | | $ 25,500 | |
| | | 15% A&E | | 3,800 | |
| | | Subtotal | | $ 29,300 | |
| | | 15% Contingency | | 4,700 | |
| | | Total | | $ 34,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 16-5<br>Sheets 16, 17 | Yorba St. Drain - La Veta Storm Drain to Almond Ave. | | | | Lateral to Channel No. 8 |
| | 1290 L.F. - 33" RCP | 41 (58) | $56 | $ 72,200 | |
| | 830 L.F. - 24" RCP | 14 (28) | 36 | 29,900 | |
| | | | Total pipe cost | $ 102,100 | |
| | | | 6 MH @ 1800 | 10,800 | |
| | | | Subtotal | $ 112,900 | |
| | | | 15% A&E | 16,900 | |
| | | | Subtotal | $ 129,800 | |
| | | | 15% Contingency | 19,200 | |
| | | | Total | $ 149,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 16-8<br>Sheets 16, 23 | Fairhaven Ave.<br>Prospect St. to<br>Wheeler Pl. | | | | |
| | 550 L.F. - 51" RCP | 98 (98) | $103 | $ 56,700 | |
| | 500 L.F. - 36" RCP | 40 (50) | 63 | 31,500 | |
| | 320 L.F. - 33" RCP | 28 (38) | 56 | 17,900 | |
| | Laurinda Way<br>Fairhaven Ave. to Stearns Dr. | | | | |
| | 540 L.F. - 27" RCP | 15 (57) | 42 | 22,700 | |
| | | | Total pipe cost | $ 128,800 | |
| | | | 6 MH @ 1800 | 10,800 | |
| | | | Subtotal | $ 139,600 | |
| | | | 15% A&E | 20,900 | |
| | | | Subtotal | $ 160,500 | |
| | | | 15% Contingency | 24,500 | |
| | | | Total | $ 185,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 16-10 Sheet 18 | Collins Ave. - Milford St. to Handy St. | | | | This drain is the easterly extension of an existing system to carry runoff under the Newport Fwy. to Tustin St. |
| | 700 L.F. - 36" RCP | 60 (81) | $63 | $ 44,100 | |
| | | 2 MH @ 1800 | | 3,600 | |
| | | Subtotal | | $ 47,700 | |
| | | 15% A&E | | 7,200 | |
| | | Subtotal | | $ 54,900 | |
| | | 15% Contingency | | 8,100 | |
| | | Total | | $ 63,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 19-1 Sheet 19 | Katella Ave. - Tustin St. to Newport Freeway | | | | |
| | 160 L.F. - 60" RCP | 228 (228) | $129 | $ 20,600 | 60" RCP will replace the 2-50"x31" CMPA in Tustin St. Cover for this pipe might be a problem. 36" RCP will be needed in addition to 24" RCP in Tustin St. |
| | 500 L.F. - 36" RCP | 29 (69) | 63 | 31,500 | |
| | 800 L.F. - 30" RCP* | 29 (44) | 49 | 39,200 | |
| | Newport Freeway to Sacramento St. | | | | |
| | 300 L.F. - 30" RCP | 33 (50) | 49 | 14,700 | |
| | Trenton Avenue Crossing | | | | *Alternative to pipe in Katella would be to cross Katella Ave. to Villa Park Road, replacing the 24" RCP with an adequate size pipe. |
| | 100 L.F. - 8'x3' RCB** | 265 (265) | 147 | 14,700 | |
| | | | Total pipe cost | $ 120,700 | |
| | | 5 MH @ 1800 | | 9,000 | **Proposed 8'x3' RCB culvert in Trenton Ave. to replace existing 6'x2.5' RCB. |
| | | | Subtotal | $ 129,700 | |
| | | 15% A&E | | 19,500 | |
| | | | Subtotal | $ 149,200 | |
| | | 15% Contingency | | 22,800 | |
| | | | Total | $ 172,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 20-5 Sheet 20 | Taft Ave. Drain. - Tustin St. to Sacramento St. | | | | This drain joins an existing 36" RCP in Tustin St. |
| | 1440 L.F. - 24" RCP | 17 (33) | $36 | $ 51,800 | |
| | | 4 MH @ 1800 | | 7,200 | |
| | | Subtotal | | $ 59,000 | |
| | | 15% A&E | | 8,900 | |
| | | Subtotal | | $ 67,900 | |
| | | 15% Contingency | | 10,100 | |
| | | Total | | $ 78,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 23-2 Sheet 23 | Fairhaven Ave. - Dunas Rd. to Woodland St. | | | | |
| | 1060 L.F. - 33" RCP | 37 (52) | $56 | $ 59,400 | |
| | | 3 MH @ 1800 | | 5,400 | |
| | | Subtotal | | $ 64,800 | |
| | | 15% A&E | | 9,700 | |
| | | Subtotal | | $ 74,500 | |
| | | 15% Contingency | | 11,500 | |
| | | Total | | $ 86,000 | |
| 23-5 Sheets 23, 24 | Prospect St. Drain. - Ruth Pl. to Palmyra Ave. | | | | |
| | 870 L.F. - 36" RCP | 46 (71) | $63 | $ 54,800 | |
| | | 3 MH @ 1800 | | 5,400 | |
| | | Subtotal | | $ 60,200 | |
| | | 15% A&E | | 9,000 | |
| | | Subtotal | | $ 69,200 | |
| | | 15% Contingency | | 10,800 | |
| | | Total | | $ 80,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 23-6 Sheet 24 | Esplanade St. Drain. - Palmyra Ave to Washington Ave. | | | | |
| | 820 L.F. - 24" RCP | 16 (29) | $36 | $ 29,500 | Existing system plus outside lane can carry 22 cfs. The 24" RCP is needed to meet arterial street requirement. |
| | | 3 MH @ 1800 | | 5,400 | |
| | | Subtotal | | $ 34,900 | |
| | | 15% A&E | | 5,200 | |
| | | Subtotal | | $ 40,100 | |
| | | 15% Contingency | | 5,900 | |
| | | Total | | $ 46,000 | |
| 24-3 Sheet 24 | Spring St. Drain. - Swidler St. to Esplanade St. | | | | This is an extension of an existing 30" RCP. |
| | 1400 L.F. - 24" RCP | 16 (34) | $36 | $ 50,400 | |
| | | 4 MH @ 1800 | | 7,200 | |
| | | Subtotal | | $ 57,600 | |
| | | 15% A&E | | 8,600 | |
| | | Subtotal | | $ 66,200 | |
| | | 15% Contingency | | 9,800 | |
| | | Total | | $ 76,000 | |

TABLE A-4.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 37-1 Sheet 37 | Chapman Ave. Drain. - at Equestrian Trail | | | | |
| | 120 L.F. - 39" RCP | 118 (139) | $70 | $ 8,400 | |
| | 1070 L.F. - 30" RCP | 67 (99) | 49 | 52,400 | The proposed system is also sized to be compatible with recently installed drains in Chapman Ave. |
| | | | Total pipe cost | $ 60,800 | |
| | | 3 MH @ 1800 | | 5,400 | |
| | | | Subtotal | $ 60,200 | |
| | | 15% A&E | | 9,900 | |
| | | | Subtotal | $ 76,100 | |
| | | 15% Contingency | | 11,900 | |
| | | | Total | $ 88,000 | |

**TABLE A-5**

PRIORITY 5

TABLE A-5.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 13-4<br>Sheets 12, 13 | Batavia St. -<br>North of Southern Pacific RR | | | | |
| | 530 L.F. - 39" RCP | 38 (56) | $70 | $ 37,100 | |
| | | 2 MH @ 1800 | | $ 3,600 | |
| | | Subtotal | | $ 40,700 | |
| | | 15% A&E | | 6,100 | |
| | | Subtotal | | $ 46,800 | |
| | | 15% Contingency | | 7,200 | |
| | | Total | | $ 54,000 | |
| 16-10<br>Sheet 17 | Sycamore Ave. Drain -<br>Wayfield St. to Sacramento St. | | | | This is a lateral to the Tustin St. drain recommended in Table A-1. |
| | 530 L.F. - 24" RCP | 20 (65) | $36 | $ 19,100 | |
| | 250 L.F. - 24" RCP | 20 (34) | 36 | 9,000 | |
| | | Total pipe cost | | $ 28,100 | |
| | | 2 MH @ 1800 | | $ 3,600 | |
| | | Subtotal | | $ 31,700 | |
| | | 15% A&E | | 4,800 | |
| | | Subtotal | | $ 36,500 | |
| | | 15% Contingency | | 5,500 | |
| | | Total | | $ 42,000 | |

TABLE A-5.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 16-10 Sheet 17 | Palm Ave. Drain - Tustin St. to Wayfield St. | | | | |
| | 600 L.F. - 27" RCP | 20 (70) | $42 | $ 25,200 | Collects overflow from Sycamore Ave. This is a lateral to the Tustin St. drain. |
| | | 2 MH @ 1800 | | $ 3,600 | |
| | | Subtotal | | $ 28,800 | |
| | | 15% A&E | | 4,300 | |
| | | Subtotal | | $ 33,100 | |
| | | 15% Contingency | | 4,900 | |
| | | Total | | $ 38,000 | |
| 23-2 Sheet 23 | Dunas Rd. Drain - Fairhaven Ave. to Romelle Ave. | | | | |
| | 700 L.F. - 30" RCP | 39 (61) | $49 | $ 34,300 | |
| | | 2 MH @ 1800 | | $ 3,600 | |
| | | Subtotal | | $ 37,900 | |
| | | 15% A&E | | 5,700 | |
| | | Subtotal | | $ 43,600 | |
| | | 15% Contingency | | 6,400 | |
| | | Total | | $ 50,000 | |

TABLE A-5.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 23-3 Sheet 23 | Southern Pacific RR Drain - Chipwood St. to Fairhaven Ave. | | | | |
| | 1400 L.F. - 27" RCP | 30 (50) | $42 | $ 58,800 | 27" RCP should be built in addition to the existing 24" RCP west of the railroad. |
| | | 4 MH @ 1800 | | $ 7,200 | |
| | | Subtotal | | $ 66,000 | |
| | | 15% A&E | | 9,900 | |
| | | Subtotal | | $ 75,900 | |
| | | 15% Contingency | | 11,100 | |
| | | Total | | $ 87,000 | |
| 23-4 Sheets 23, 24 | Violet St. Drain - Craig Dr. to Palmyra Ave. | | | | |
| | 230 L.F. - 24" RCP | 10 (47) | $36 | $ 8,300 | |
| | 700 L.F. - 24" RCP | 10 (38) | 36 | 25,200 | |
| | | Total pipe cost | | $ 33,500 | |
| | | 3 MH @ 1800 | | $ 5,400 | |
| | | Subtotal | | $ 38,900 | |
| | | 15% A&E | | 5,800 | |
| | | Subtotal | | $ 44,700 | |
| | | 15% Contingency | | 6,300 | |
| | | Total | | $ 51,000 | |

TABLE A-5.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 23-6<br>Sheet 23 | James St. Drain -<br>La Veta Ave. to Dorothy Dr. | | | | |
| | 700 L.F. - 24" RCP | 14 (56) | $36 | $ 25,200 | |
| | | 2 MH @ 1800 | | $ 3,600 | |
| | | Subtotal | | $ 28,800 | |
| | | 15% A&E | | 4,300 | |
| | | Subtotal | | $ 33,100 | |
| | | 15% Contingency | | 4,900 | |
| | | Total | | $ 38,000 | |
| 24-4<br>Sheet 24 | Earlham-Sycamore Drain -<br>Palm Ave. to Sycamore Ave. | | | | This is an extension of an existing 45" RCP. |
| | 300 L.F. - 33" RCP | 22 (57) | $56 | $ 16,800 | |
| | | 2 MH @ 1800 | | $ 3,600 | |
| | | Subtotal | | $ 20,400 | |
| | | 15% A&E | | 3,100 | |
| | | Subtotal | | $ 23,500 | |
| | | 15% Contingency | | 3,500 | |
| | | Total | | $ 27,000 | |

TABLE A-5.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 31-1 Sheet 31 | Walnut Ave. Drain - Rancho Santiago Blvd. to Richard St. | | | | |
| | 500 L.F. - 36" RCP | 35 (62) | $63 | $ 31,500 | |
| | Bond Ave. Drain - Rancho Santiago Blvd. to Birchwood Rd. | | | | |
| | 1300 L.F. - 24" RCP | 45 (92) | $36 | $ 46,800 | |
| | Rancho Santiago Drain - Bond Ave. to Condor Crest Ave. | | | | |
| | 1200 L.F. - 33" RCP | 55 (75) | 56 | 67,200 | |
| | | | Total pipe cost | $ 145,500 | |
| | | | 9 MH @ 1800 | $ 16,200 | |
| | | | Subtotal | $ 161,700 | |
| | | | 15% A&E | 24,300 | |
| | | | Subtotal | $ 186,000 | |
| | | | 15% Contingency | 28,000 | |
| | | | Total | $ 214,000 | |

TABLE A-5.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 35-2 Sheet 35 | Handy Creek Trib. - Peters Canyon Reservoir to Cowan Heights Drive | | | | |
| | 1030 L.F. - 42" RCP | 195 (195) | $79 | $ 81,400 | A grass-lined channel is an alternative to underground conduits in this area. |
| | 1350 L.F. - 27" RCP | 74 (88) | 42 | 56,700 | |
| | | Total pipe cost | | $ 138,100 | |
| | | 6 MH @ 1800 | | $ 10,800 | |
| | | Subtotal | | $ 148,900 | |
| | | 15% A&E | | 22,300 | |
| | | Subtotal | | $ 171,200 | |
| | | 15% Contingency | | 25,800 | |
| | | Total | | $ 197,000 | |
| 37-3 Sheet 37 | Handy Creek Trib. - Handy Creek to Ranch Wood Trail | | | | |
| | 650 L.F. - 30" RCP | 62 (62) | $49 | $ 31,900 | An open channel would be an alternative to the underground conduit. |
| | | 2 MH @ 1800 | | $ 3,600 | |
| | | Subtotal | | $ 35,500 | |
| | | 15% A&E | | 5,300 | |
| | | Subtotal | | $ 40,800 | |
| | | 15% Contingency | | 6,200 | |
| | | Total | | $ 47,000 | |

TABLE A-5.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 37-6 Sheets 31, 37 | Amapola Ave. Drain - Handy Creek to Meads Ave. | | | | |
| | 900 L.F. - 66" RCP | 237 (292) | 147 | $ 132,300 | |
| | 800 L.F. - 42" RCP | 105 (175) | 79 | 63,200 | |
| | 1750 L.F. - 39" RCP | 100 (172) | 70 | 122,500 | |
| | | Total pipe cost | | $ 318,000 | |
| | | 9 MH @ 1800 | | $ 16,200 | |
| | | Subtotal | | $ 334,200 | |
| | | 15% A&E | | 50,100 | |
| | | Subtotal | | $ 384,300 | |
| | | 15% Contingency | | 57,700 | |
| | | Total | | $ 442,000 | |

TABLE A-5.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 38-2 Sheet 38 | Handy Creek Tributaries - Handy Creek to Meads Ave. | | | | |
| | 480 L.F. - 45" RCP | 249 (249) | $86 | $ 41,300 | This drain follows an existing watercourse. Improvement and upgrading of the watercourse is an alternative to pipe. |
| | 800 L.F. - 36" RCP | 81 (81) | 63 | 50,400 | |
| | Handy Creek to Randall & Meads Ave. | | | | |
| | 860 L.F. - 42" RCP | 111 (148) | 79 | 68,000 | |
| | Santiago Canyon Rd. Orange Park Blvd. to Meads Ave. | | | | |
| | 1400 L.F. - 36" RCP | 65 (83) | 63 | 88,200 | This 36" RCP is an extension of an existing drain in Santiago Canyon Road. |
| | | Total pipe cost | | $ 247,900 | |
| | | 9 MH @ 1800 | | $ 16,200 | |
| | | Subtotal | | $ 264,100 | |
| | | 15% A&E | | 39,600 | |
| | | Subtotal | | $ 303,700 | |
| | | 15% Contingency | | 45,300 | |
| | | Total | | $ 349,000 | |

## TABLE A-6

UNDEVELOPED AREAS

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 20-1 Sheet 28 | Meats Ave. Extension | | | | |
| | 530 L.F. - 36" RCP | 152 (222) | $63 | $ 33,400 | |
| | 1000 L.F. - 27" RCP | 126 (196) | 42 | 42,000 | |
| | 720 L.F. - 24" RCP | 20 (90) | 36 | 25,900 | |
| | | Total pipe cost | | $ 101,300 | |
| | | 6 MH @ 1800 | | $ 10,800 | |
| | | Subtotal | | $ 112,100 | |
| | | 15% A&E | | 16,800 | |
| | | Subtotal | | $ 128,900 | |
| | | 15% Contingency | | 19,100 | |
| | | Total | | $ 148,000 | |
| 30-2 Sheets 30, 35, 36 | Chapman Ave. - Crawford Canyon Road | | | | |
| | 900 L.F. - 45" RCP | 237 (308) | $86 | $ 77,400 | |
| | 1200 L.F. - 27" RCP | 67 (137) | 42 | 50,400 | |
| | 800 L.F. - 24" RCP | 58 (128) | 36 | 28,800 | |
| | Lateral 1 - Chapman Ave. 1500 L.F.- 24" RCP | 37 (57) | 36 | 54,000 | |
| | Lateral 2 - Pearl St. 1600 L.F. - 24" RCP | 42 (112) | 36 | 57,600 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 30-2 Cont. | Lateral 3 | | | | |
| | 1000 L.F. - 27" RCP | 64 (134) | $42 | $ 42,000 | |
| | 800 L.F. - 24" RCP | 11 (81) | 36 | 28,800 | |
| | Lateral 4 | | | | |
| | 900 L.F. - 30" RCP | 125 (195) | 49 | 44,100 | |
| | 400 L.F. - 24" RCP | 18 (84) | 36 | 14,400 | |
| | | | Total pipe cost | $ 397,500 | |
| | | | 24 MH @ 1800 | $ 43,200 | |
| | | | Subtotal | $ 440,700 | |
| | | | 15% A&E | 66,100 | |
| | | | Subtotal | $ 506,800 | |
| | | | 15% Contingency | 76,200 | |
| | | | Total | $ 583,000 | |
| 34-2 Sheet 34 | North of Cerro Villa Dr. | | | | |
| | 250 L.F. - 27" RCP | 76 (146) | $42 | $ 10,500 | |
| | 650 L.F. - 24" RCP | 18 (88) | 36 | 23,400 | |
| | | | Total pipe cost | $ 33,900 | |
| | | | 2 MH @ 1800 | $ 3,600 | |
| | | | Subtotal | $ 37,500 | |
| | | | 15% A&E | 5,600 | |
| | | | Subtotal | $ 43,100 | |
| | | | 15% Contingency | 6,900 | |
| | | | Total | $ 50,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 34-3 Sheet 34 | West of Cerro Villa Dr. 430 L.F. - 33" RCP | 82 (152) | $56 | $ 24,100 | |
| | | 2 MH @ 1800 | | $ 3,600 | |
| | | Subtotal | | $ 27,700 | |
| | | 15% A&E | | 4,200 | |
| | | Subtotal | | $ 31,900 | |
| | | 15% Contingency | | 5,100 | |
| | | Total | | $ 37,000 | |
| 34-4 Sheet 34 | Villa Park Extensions 600 L.F. - 36" RCP | 58 (58) | $63 | $ 37,800 | Extensions of existing storm drain in the City of Villa Park. |
| | 600 L.F. - 27" RCP | 63 (63) | 42 | 25,200 | |
| | | Total pipe cost | | $ 63,000 | |
| | | 3 MH @ 1800 | | $ 5,400 | |
| | | Subtotal | | $ 68,400 | |
| | | 15% A&E | | 10,300 | |
| | | Subtotal | | $ 78,700 | |
| | | 15% Contingency | | 11,300 | |
| | | Total | | $ 90,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 34-5 Sheet 33, 34 | At Loma St. | | | | |
| | 930 L.F. - 39" RCP | 153 (223) | $ 70 | $ 65,100 | |
| | 1400 L.F. - 30" RCP | 120 (190) | 49 | 68,600 | |
| | | Total pipe cost | | $ 133,700 | |
| | | 6 MH @ 1800 | | $ 10,800 | |
| | | Subtotal | | $ 144,500 | |
| | | 15% A&E | | 21,700 | |
| | | Subtotal | | $ 166,200 | |
| | | 15% Contingency | | 24,800 | |
| | | Total | | $ 191,000 | |
| 36-1 Sheet 36 | Along Newport Blvd. to Handy Creek | | | | |
| | 1750 L.F. - 51" RCP | 192 (262) | $103 | $ 180,300 | |
| | 700 L.F. - 51" RCP | 264 (264) | 103 | 72,100 | |
| | 400 L.F. - 30" RCP | 80 (150) | 49 | 19,600 | |
| | | Total pipe cost | | $ 272,000 | |
| | | 7 MH @ 1800 | | $ 12,600 | |
| | | Subtotal | | $ 284,600 | |
| | | 15% A&E | | 42,700 | |
| | | Subtotal | | $ 327,300 | |
| | | 15% Contingency | | 48,700 | |
| | | Total | | $ 376,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 36-2 Sheet 36 | Handy Creek to Newport Blvd. 770 L.F. - 33" RCP | 105 (105) | $56 | $ 43,100 | |
| | | 2 MH @ 1800 | | 3,600 | |
| | | Subtotal | | $ 46,700 | |
| | | 15% A&E | | 7,000 | |
| | | Subtotal | | $ 53,700 | |
| | | 15% Contingency | | 8,300 | |
| | | Subtotal | | $ 62,000 | |
| 39-3 Sheet 39 | Handy Creek Tributary 1550 L.F. - 24" RCP | 49 (119) | $36 | $ 55,800 | |
| | | 4 MH @ 1800 | | $ 7,200 | |
| | | Subtotal | | $ 63,000 | |
| | | 15% A&E | | 9,500 | |
| | | Subtotal | | $ 72,500 | |
| | | 15% Contingency | | 10,500 | |
| | | Total | | $ 83,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 39-5 Sheets 39, 47 | Handy Creek Tributary | | | | |
| | 800 L.F. - 45" RCP | 272 (342) | $86 | $ 68,800 | |
| | 1400 L.F. - 42" RCP | 216 (296) | 79 | 110,600 | |
| | 1500 L.F. - 30" RCP | 40 (110) | 49 | 73,500 | |
| | 200 L.F. - 24" RCP | 26 (96) | 36 | 7,200 | |
| | | Total pipe cost | | $ 260,100 | |
| | | 10 MH @ 1800 | | $ 18,000 | |
| | | Subtotal | | $ 278,100 | |
| | | 15% A&E | | 41,700 | |
| | | Subtotal | | $ 319,800 | |
| | | 15% Contingency | | 48,200 | |
| | | Total | | $ 368,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 39-6 | Santiago Creek Trib. | | | | |
| Sheets 39, 40, 48 | 700 L.F. - 57" RCP | 489 (489) | $120 | $ 84,000 | |
| | 700 L.F. - 54" RCP | 392 (462) | 111 | 77,700 | |
| | 950 L.F. - 45" RCP | 272 (342) | 86 | 81,700 | |
| | 600 L.F. - 36" RCP | 176 (246) | 63 | 37,800 | |
| | 650 L.F. - 33" RCP | 135 (165) | 56 | 36,400 | |
| | 250 L.F. - 27" RCP | 80 (150) | 42 | 10,500 | |
| | 600 L.F. - 24" RCP | 22 (92) | 36 | 21,600 | |
| | 200 L.F. - 24" RCP | 16 (86) | 36 | 7,200 | |
| | | Total pipe cost | | $ 356,900 | |
| | | 12 MH @ 1800 | | $ 21,600 | |
| | | Subtotal | | $ 378,500 | |
| | | 15% A&E | | 56,800 | |
| | | Subtotal | | $ 435,300 | |
| | | 15% Contingency | | 65,700 | |
| | | Total | | $ 501,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 39-7 Sheet 39 | Santiago Creek Trib. 600 L.F. - 30" RCP | 59 (59) | $ 49 | $ 29,400 | |
| | | 2 MH @ 1800 | | $ 3,600 | |
| | | Subtotal | | $ 33,000 | |
| | | 15% A&E | | 5,000 | |
| | | Subtotal | | $ 38,000 | |
| | | 15% Contingency | | 6,000 | |
| | | Total | | $ 44,000 | |
| 39-8 Sheet 39, 40 | Santiago Creek Trib. 870 L.F. - 51" RCP | 225 | $103 | $ 89,600 | |
| | 650 L.F. - 33" RCP | 148 (218) | 56 | 36,400 | |
| | 1150 L.F. - 30" RCP | 92 (162) | 49 | 56,400 | |
| | | Total pipe cost | | $ 182,400 | |
| | | 7 MH @ 1800 | | 12,600 | |
| | | Subtotal | | $ 195,000 | |
| | | 15% A&E | | 29,300 | |
| | | Subtotal | | $ 224,300 | |
| | | 15% Contingency | | 33,700 | |
| | | Total | | $ 258,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 39-9 Sheet 33 | North of Serrano Ave. at Yellowstone Blvd. | | | | |
| | 1200 L.F. - 30" RCP | 92 (162) | $49 | $ 58,800 | |
| | 1200 L.F. - 24" RCP | 50 (120) | 36 | 43,200 | |
| | | | Total pipe cost | $ 102,000 | |
| | | 6 MH @ 1800 | | 10,800 | |
| | | Subtotal | | $ 112,800 | |
| | | 15% A&E | | 16,900 | |
| | | Subtotal | | $ 129,700 | |
| | | 15% Contingency | | 19,300 | |
| | | Total | | $ 149,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 43-1 | Peters Canyon Reservoir Trib. | | | | |
| Sheet 43, 51 | 1200 L.F. - 69" RCP | 519 (519) | $156 | $ 187,200 | Consideration should be |
| | 1050 L.F. - 60" RCP | 386 (456) | 129 | 135,500 | given to open channel |
| | 800 L.F. - 60" RCP | 351 (421) | 129 | 103,200 | facilities for the lower |
| | 650 L.F. - 48" RCP | 274 (344) | 94 | 61,100 | reaches of this system. |
| | 1600 L.F. - 36" RCP | 169 (239) | 63 | 100,800 | |
| | 250 L.F. - 36" RCP | 141 (211) | 63 | 15,800 | |
| | 1900 L.F. - 30" RCP | 102 (172) | 49 | 93,100 | |
| | 600 L.F. - 24" RCP | 23 (93) | 36 | 21,600 | |
| | | | Total pipe cost | $ 718,300 | |
| | | | 20 MH @ 1800 | 36,000 | |
| | | | Subtotal | $ 754,300 | |
| | | | 15% A&E | 113,100 | |
| | | | Subtotal | $ 867,400 | |
| | | | 15% Contingency | 130,600 | |
| | | | Total | $ 998,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 44-1 Sheet 44, 52 | Trib. to Santiago Creek at Irvine Park | | | | |
| | 600 L.F. - 45" RCP | 194 (194) | $86 | $ 51,600 | |
| | 1100 L.F. - 36" RCP | 123 (194) | 63 | 69,300 | |
| | 2000 L.F. - 27" RCP | 66 (136) | 42 | 84,000 | |
| | 650 L.F. - 24" RCP | 19 (89) | 36 | 23,400 | |
| | | | Total pipe cost | $ 228,300 | |
| | | 11 MH @ 1800 | | 19,800 | |
| | | | Subtotal | $ 248,100 | |
| | | 15% A&E | | 37,200 | |
| | | | Subtotal | $ 285,300 | |
| | | 15% Contingency | | 42,700 | |
| | | | Total | $ 328,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 44-2 Sheet 44 & 43 | Peters Canyon Reservoir Trib. | | | | |
| | 1200 L.F. - 63" RCP | 319 (319) | $138 | $ 165,600 | |
| | 1600 L.F. - 45" RCP | 149 (219) | 86 | 137,600 | |
| | 600 L.F. - 24" RCP | 40 (110) | 36 | 21,600 | |
| | Lateral 1 | | | | |
| | 1400 L.F. - 24" RCP | 49 (119) | 36 | 50,400 | |
| | | | Total pipe cost | $ 375,200 | |
| | | | 12 MH @ 1800 | 21,600 | |
| | | | Subtotal | $ 396,800 | |
| | | | 15% A&E | 59,500 | |
| | | | Subtotal | $ 456,300 | |
| | | | 15% Contingency | 68,700 | |
| | | | Total | $ 525,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 44-3 Sheet 36 & 44 | Handy Creek Trib. | | | | |
| | 800 L.F. - 39" RCP | 110 (110) | $70 | $ 56,000 | |
| | 1400 L.F. - 27" RCP | 40 (110) | 42 | 58,800 | |
| | 1670 L.F. - 24" RCP | 25 (95) | 36 | 60,100 | |
| | | | Total pipe cost | $ 174,900 | |
| | | 10 MH @ 1800 | | 18,000 | |
| | | | Subtotal | $ 192,900 | |
| | | 15% A&E | | 28,900 | |
| | | | Subtotal | $ 221,800 | |
| | | 15% Contingency | | 33,200 | |
| | | | Total | $ 255,000 | |
| 45-1 Sheet 45 | Santiago Creek Trib. 1600 L.F. - 24" RCP | 53 (53) | $36 | $ 57,600 | |
| | | 4 MH @ 1800 | | 7,200 | |
| | | | Subtotal | $ 64,800 | |
| | | 15% A&E | | 9,700 | |
| | | | Subtotal | $ 74,500 | |
| | | 15% Contingency | | 11,500 | |
| | | | Total | $ 86,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 45-2 Sheet 45 | Santiago Creek Trib. 850 L.F. - 30" RCP | 103 (103) | $49 | $ 41,700 | |
| | | 3 MH @ 1800 | | 5,400 | |
| | | Subtotal | | $ 47,100 | |
| | | 15% A&E | | 7,100 | |
| | | Subtotal | | $ 54,200 | |
| | | 15% Contingency | | 7,800 | |
| | | Total | | $ 62,000 | |
| 45-3 Sheet 45 | Santiago Creek Trib. 900 L.F. - 24" RCP | 45 (45) | $36 | $ 32,400 | |
| | | 3 MH @ 1800 | | 5,400 | |
| | | Subtotal | | $ 37,800 | |
| | | 15% A&E | | 5,700 | |
| | | Subtotal | | $ 43,500 | |
| | | 15% Contingency | | 6,500 | |
| | | Total | | $ 50,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 46-1<br>Sheets 46, 47<br>55, 56 | Santiago Creek Trib.<br>Weir Canyon<br>Possible Regional Facility - Main Line | | | | Qualifies as a possible Regional Facility due to large drainage area. |
| | 1300 L.F. - 114" RCP | 2147 (2147) | $316 | $ 410,800 | RCB or Open Channel should be considered as alternatives to RCP. |
| | 600 L.F. - 114" RCP | 2083 (2083) | 316 | 189,600 | |
| | 1100 L.F. - 108" RCP | 1939 (2009) | 293 | 322,300 | |
| | 450 L.F. - 108" RCP | 1880 (1950) | 293 | 131,900 | |
| | 2000 L.F. - 96" RCP | 1734 (1804) | 249 | 498,000 | |
| | 700 L.F. - 90" RCP | 1575 (1645) | 228 | 159,600 | |
| | 650 L.F. - 84" RCP | 1044 (1114) | 206 | 133,900 | |
| | 800 L.F. - 78" RCP | 985 (1055) | 186 | 148,800 | |
| | 2400 L.F. - 78" RCP | 868 (938) | 186 | 446,400 | |
| | 1900 L.F. - 72" RCP | 757 (827) | 166 | 315,400 | |
| | | Total pipe cost | | $2,756,700 | |
| | | 30 MH @ 1800 | | 54,000 | |
| | | Subtotal | | $2,810,700 | |
| | | 15% A&E | | 421,600 | |
| | | Subtotal | | $3,232,300 | |
| | | 15% Contingency | | 484,700 | |
| | | Total | | $3,717,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 46-1<br>Sheets 46, 47<br>55, 56 | Weir Canyon<br>Possible Regional Facility -<br>Laterals | | | | |
| | Lateral 1<br>900 L.F. - 24" RCP | 25 (95) | $36 | $ 32,400 | These are laterals that are directly tributary to the portion of the Weir Canyon system that is a possible regional facility. However, it is expected that they would be constructed as City facilities. |
| | Lateral 2<br>250 L.F. - 33" RCP<br>1200 L.F. - 27" RCP<br>850 L.F. - 24" RCP | 88 (158)<br>52 (122)<br>27 (97) | 56<br>42<br>36 | 14,000<br>50,400<br>30,600 | |
| | Lateral 3<br>1100 L.F. - 24" RCP | 21 (91) | 36 | 39,600 | |
| | Lateral 4<br>1700 L.F. - 27" RCP | 65 (135) | 42 | 71,400 | |
| | Lateral 5<br>770 L.F. - 72" RCP<br>2000 L.F. - 60" RCP<br>1450 L.F. - 54" RCP<br>900 L.F. - 36" RCP | 551 (621)<br>504 (574)<br>320 (390)<br>107 (177) | 166<br>129<br>111<br>63 | 127,800<br>258,000<br>161,000<br>56,700 | |
| | Lateral 5-1<br>600 L.F. - 24" RCP | 13 (83) | 36 | 21,600 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 46-1 (Cont.) | Lateral 5-2<br>1750 L.F. - 33" RCP | 98 (168) | 56 | 98,000 | |
| | Lateral 6<br>800 L.F. - 24" RCP | 74 (74) | 36 | 28,800 | |
| | Lateral 7<br>1900 L.F. - 24" RCP | 48 (118) | 36 | 68,400 | |
| | | | Total pipe cost | $1,058,700 | |
| | | | 41 MH @ 1800 | 73,800 | |
| | | | Subtotal | $1,132,500 | |
| | | | 15% A&E | 169,900 | |
| | | | Subtotal | $1,302,400 | |
| | | | 15% Contingency | 195,600 | |
| | | | Total | $1,498,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 46-1 Sheets 56, 57 | Main Line - Weir Canyon | | | | |
| | 900 L.F. - 51" RCP | 258 (328) | $103 | $ 92,700 | Drainage area less than 500 acres. Qualifies as local facility. |
| | 1250 L.F. - 45" RCP | 209 (279) | 86 | 107,500 | |
| | 400 L.F. - 27" RCP | 55 (125) | 42 | 16,800 | |
| | 1300 L.F. - 24" RCP | 30 (101) | 36 | 46,800 | |
| | Lateral 8 | | | | |
| | 950 L.F. - 48" RCP | 380 (450) | 94 | 89,300 | |
| | 860 L.F. - 48" RCP | 227 (297) | 94 | 80,800 | |
| | 800 L.F. - 30" RCP | 88 (158) | 49 | 39,200 | |
| | 660 L.F. - 24" RCP | 30 (100) | 36 | 23,800 | |
| | 160 L.F. - 24" RCP | 18 (88) | 36 | 5,800 | |
| | Lateral 8-1 | | | | |
| | 1020 L.F. - 24" RCP | 42 (112) | 36 | 36,700 | |
| | Lateral 8-2 | | | | |
| | 1850 L.F. - 24" RCP | 53 (123) | 36 | 66,600 | |
| | Lateral 9 | | | | |
| | 1820 L.F. - 24" RCP | 54 (124) | 36 | 65,500 | |
| | | | Total pipe cost | $ 671,500 | |
| | | | 29 MH @ 1800 | 52,200 | |
| | | | Subtotal | $ 723,700 | |
| | | | 15% A&E | 108,600 | |
| | | | Subtotal | $ 832,300 | |
| | | | 15% Contingency | 124,700 | |
| | | | Total | $ 957,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 46-2<br>Sheet 46 | Santiago Creek Trib.<br>Possible Regional Facility<br>1200 L.F. - 84" RCP | 791 (791) | $206 | $ 247,200 | Drainage area greater than 500 acres. |
| | | 3 MH @ 1800 | | 5,400 | |
| | | Subtotal | | $ 252,600 | |
| | | 15% A&E | | 37,900 | |
| | | Subtotal | | $ 290,500 | |
| | | 15% Contingency | | 43,500 | |
| | | Total | | $ 334,000 | |
| 46-2<br>Sheet 46 & 54 | Main Line<br>1500 L.F. - 72" RCP | 659 (729) | $166 | $ 249,000 | Drainage area less than 500 acres. |
| | 2200 L.F. - 66" RCP | 562 (631) | 147 | 323,400 | |
| | 2000 L.F. - 54" RCP | 457 (527) | 111 | 222,000 | |
| | 2050 L.F. - 39" RCP | 140 (210) | 70 | 143,500 | |
| | 1050 L.F. - 24" RCP | 52 (120) | 36 | 37,800 | |
| | Lateral 1<br>700 L.F. - 36" RCP | 140 (210) | 63 | 44,100 | |
| | 500 L.F. - 33" RCP | 100 (170) | 56 | 28,000 | |
| | 700 L.F. - 24" RCP | 31 (101) | 36 | 25,200 | |
| | | Total pipe cost | | $1,073,000 | |
| | | 27 MH @ 1800 | | 48,600 | |
| | | Subtotal | | $1,121,600 | |
| | | 15% A&E | | 168,200 | |
| | | Subtotal | | $1,289,800 | |
| | | 15% Contingency | | 193,200 | |
| | | Total | | $1,483,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 46-3<br>Sheet 46 | Santiago Creek Trib.<br>600 L.F. - 24" RCP | 63 (63) | $36 | $ 21,600 | |
| | | 2 MH @ 1800 | | 3,600 | |
| | | Subtotal | | $ 25,200 | |
| | | 15% A&E | | 3,800 | |
| | | Subtotal | | $ 29,000 | |
| | | 15% Contingency | | 4,000 | |
| | | Total | | $ 33,000 | |
| 52-1<br>Sheet 52 | Santiago Creek Trib.<br>Main Line | | | | |
| | 1000 L.F. - 48" RCP | 239 (309) | $94 | $ 94,000 | |
| | 1300 L.F. - 30" RCP | 89 (159) | 49 | 63,700 | |
| | 750 L.F. - 24" RCP | 58 (128) | 36 | 27,000 | |
| | Lateral 1<br>1650 L.F. - 27" RCP | 68 (137) | 42 | 69,300 | |
| | | Total pipe cost | | $ 254,000 | |
| | | 12 MH @ 1800 | | 21,600 | |
| | | Subtotal | | $ 275,600 | |
| | | 15% A&E | | 41,300 | |
| | | Subtotal | | $ 316,900 | |
| | | 15% Contingency | | 47,100 | |
| | | Total | | $ 364,000 | |

TABLE A-6.

| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 53-1 Sheet 53 | Santiago Creek Trib. | | | | |
| | 570 L.F. - 36" RCP | 155 (155) | $63 | $ 35,900 | |
| | 1050 L.F. - 24" RCP | 49 (139) | 36 | 37,800 | |
| | | | Total pipe cost | $ 73,700 | |
| | | | 5 MH @ 1800 | 9,000 | |
| | | | Subtotal | $ 82,700 | |
| | | | 15% A&E | 12,400 | |
| | | | Subtotal | $ 95,100 | |
| | | | 15% Contingency | 13,900 | |
| | | | Total | $ 109,000 | |
| 53-2 Sheet 53 | Santiago Creek Trib. | | | | |
| | 1350 L.F. - 36" RCP | 124 (124) | $63 | $ 85,100 | |
| | 1050 L.F. - 24" RCP | 26 (96) | 36 | 37,800 | |
| | | | Total pipe cost | $ 122,900 | |
| | | | 6 MH @ 1800 | 10,800 | |
| | | | Subtotal | $ 133,700 | |
| | | | 15% A&E | 20,100 | |
| | | | Subtotal | $ 153,800 | |
| | | | 15% Contingency | 23,200 | |
| | | | Total | $ 177,000 | |

TABLE A-6.

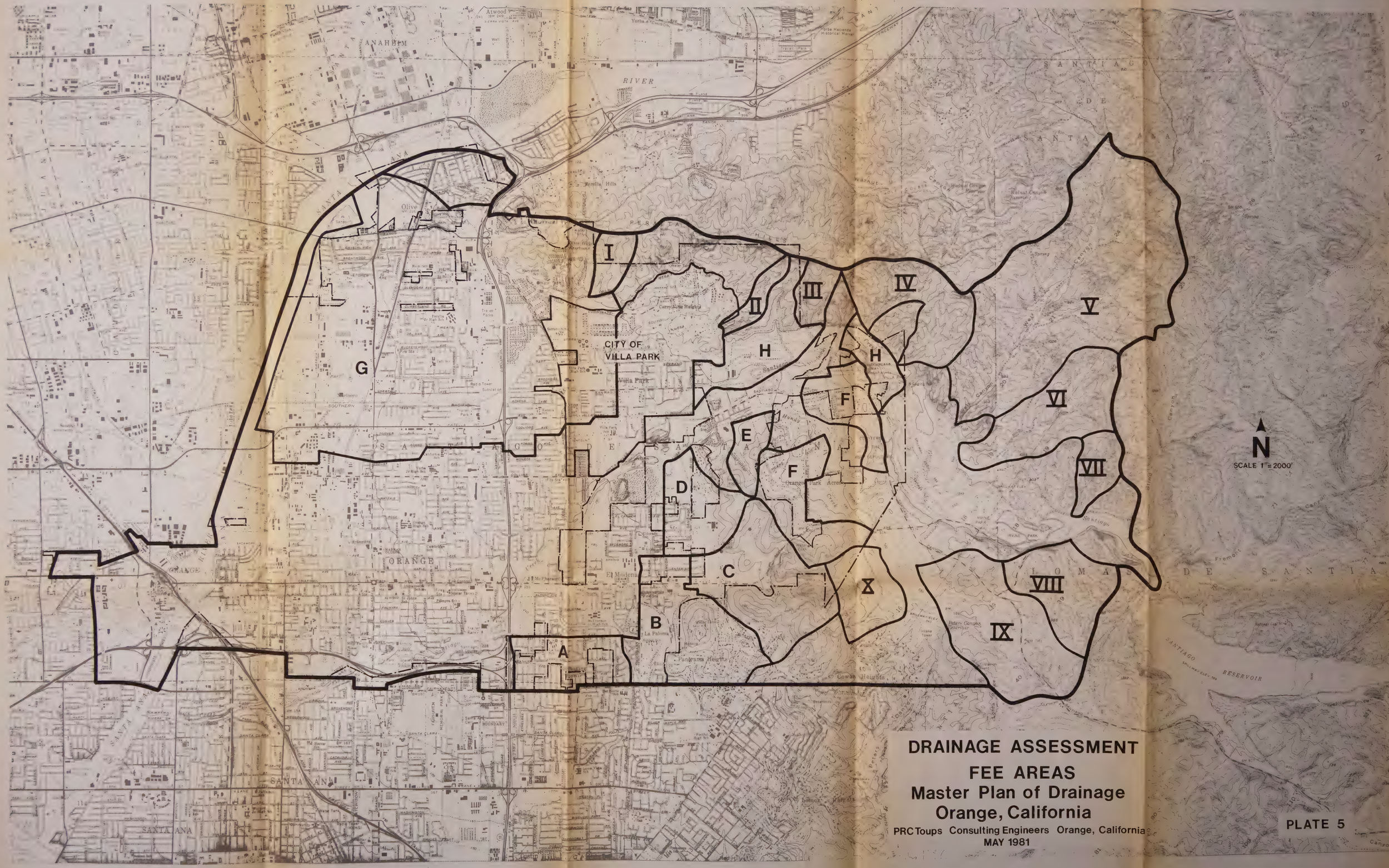
| Facility Area Number | Facility Location and Description | Design Flow cfs | Cost Estimate (January 1981) ENR CCI (L.A.) = 4079.5 Unit Cost | Extension | Remarks |
|---|---|---|---|---|---|
| 53-3 Sheet 53 | Santiago Creek Trib. | | | | |
| | 1630 L.F. - 42" RCP | 226 (226) | $79 | $ 128,800 | |
| | 240 L.F. - 33" RCP | 123 (193) | 56 | 13,400 | |
| | 1500 L.F. - 24" RCP | 71 (161) | 36 | 54,000 | |
| | | | Total pipe cost | $ 196,200 | |
| | | 9 MH @ 1800 | | 16,200 | |
| | | | Subtotal | $ 212,400 | |
| | | 15% A&E | | 31,900 | |
| | | | Subtotal | $ 244,300 | |
| | | 15% Contingency | | 36,700 | |
| | | | Total | $ 281,000 | |

PLATE 4

EXISTING AND PROPOSED
DRAINAGE FACILITIES

PLATE 5

DRAINAGE ASSESSMENT
FEE AREAS




# DRAINAGE ASSESSMENT FEE AREAS
## Master Plan of Drainage
## Orange, California

PRC Toups Consulting Engineers Orange, California
MAY 1981

PLATE 5

STUDY AREA BOUNDARY

CITY OF VILLA PARK

VILLA PARK DAM RESERVOIR

PETERS CANYON RESERVOIR

N

SCALE 1"=2000'

## Legend

- Corporate Boundary
- 12 — 1"=200' Scale Base Map No.
- 28-5 — Drainage Area Number
- Major Drainage Boundary
- Sub-Area Boundary
- Proposed Regional Facility
- Existing Regional Facility
- Proposed Local Facility
- Existing Local Facility
- (36) — Reinforced Concrete Pipe (Dia.-Inches)
- 5x3 — Existing Reinforced Concrete Box
- Existing Trapezoidal Channel

# EXISTING AND PROPOSED DRAINAGE FACILITIES

## Master Plan of Drainage

## Orange, California

PRC Toups Consulting Engineers Orange, California

MAY 1981

PLATE 4


## Legend

Corporate Boundary

12 1"= 200' Scale Base

28-5 Drainage Area

Major D

C